MODEL 3100B

PROGRAMMABLE AUDIO GENERATOR

OPERATOR'S MANUAL

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FOREWORD

The 3100B Generator was designed as an easy-to-use audio generator providing maximum flexibility. The 3100B Generator outputs numerous different waveforms, has extensive front panel memory capabilities, can be operated under remote control, and can be used as a remote controller for the companion 3200A/B Analyzer.

This manual is divided into 8 sections. Section 1 provides an overview of the capabilities of the 3100B Generator and an orientation to the front panel design. Section 2 provides detailed examples of usage of the 3100B Generator under manual control. Section 3 explains the front panel programmability features. Section 4 examines the method of using the 3100B Generator as a remote controller for the companion 3200A/B Analyzer. Section 5 reviews each front panel control button and will be useful as a reference guide during operation. Section 6 explains usage of the 3100B Generator with external controllers via the G.P.I.B. (General Purpose Interface Bus) or the RS-232 bus. Section 7 details the most common usage errors encountered in using the 3100B Generator and the suggested method of rectifying the errors.

* * * C A U T I O N * * *

THE 3100B GENERATOR HAS THE CAPABILITY OF OUTPUTTING SIGNALS OF UP TO 30 DBM INTO 600 OHMS WITH BOTH CHANNELS DRIVEN. CHECK THAT YOUR LOAD RESISTANCE OR DEVICE UNDER TEST WILL NOT BE DAMAGED BEFORE OUTPUTTING LEVELS IN EXCESS OF 10 DBM 600.

ALSO NOTE THAT THE 3100B PROVIDES THE UNUSUAL CAPABILITY OF KEYING IN THE LOAD RESISTANCE; THAT IS, THE INPUT RESISTANCE OF THE DEVICE BEING DRIVEN BY THE 3100B. IF TWO CHANNELS ARE DRIVEN, THE 3100B EXPECTS TO SEE THE SAME LOAD RESISTANCE ON BOTH CHANNELS. WHEN YOU ASK FOR A PARTICULAR OUTPUT LEVEL, A COMPUTATION IS DONE INTERNALLY THAT TAKES INTO ACCOUNT SELECTED SOURCE RESISTANCE, LOAD RESISTANCE, AND NUMBER OF CHANNELS DRIVEN (1 OF 2) IN ORDER TO DETERMINE OUTPUT ATTENUATOR SETTING. A COMMON ERROR IS TO HAVE LOAD RESISTANCE SET TO 600 OHM AND THEN CONNECT THE 3100B TO A HIGH IMPEDANCE VOLTMETER TO READ LEVEL. THE OUTPUT WILL, OF COURSE, BE TOO HIGH.

SECTION 1

OPERATIONAL CHARACTERISTICS

1-1 GENERAL

The 3100B Generator is a programmable audio oscillator with the capability of generating sinewaves, squarewaves, intermodulation distortion test signals, toneburst and sine/step waveforms. The output of the oscillator is two channel, electronically balanced and completely floating.

The 3100B Generator can be operated in a manual mode, via front panel programmability, or by remote control with an external computer. The manual mode is accessed by operating the buttons on the front panel. The front panel programmability mode is operated by using the front panel controls to store various test sequences into non-volatile memory (no external computer). The 3100B Generator can also be operated under remote control mode via RS-232 bus or G.P.I.B. (General Purpose Interface Bus) by any suitable computer (i.e., I.B.M. P.C., A.T., X.T., Apple II, MacIntosh; H.P. 80 Series; etc.).

The 3100B Generator may be used with the Sound Technology 1510A Tape Recorder/Audio Test System, the Sound Technology 1530A MTS-Stereo Analyzer/Monitor, the Sound Technology 3200A/B Programmable Audio Analyzer, with other analyzers, or as a stand-alone signal source. The 3100B Generator can also be used to operate the Sound Technology Model 3200A/B Analyzer under remote control via Frequency Shift Keying techniques.

1-2 SPECIFICATIONS

A. SINEWAVE, TONEBURST, SINE/STEP

Frequency Range	10 Hz to 102.39 kHz Frequencies of 1 Hz to 9.9 Hz can be used in Fixed Parameter mode after initial usage of oscillator.
Frequency Resolution	.01% 10 Hz to 102.39 kHz
Frequency Accuracy	.03% FIXED PARAMETERS and FREQ SWEEP - SELECTED .1% FREQ SWEEP - LOG < 10.2 kHz, 0.3% FREQ SWEEP - LOG > 10.2 kHz
Frequency Sweep - Log	User selectable 4 to 255 points/decade, internally calculated to provide linear increments on a log-frequency scale; start and stop frequencies selectable over entire range. Sweep direction determined by selection of start and stop frequencies.
Frequency Sweep - Selected	In this test mode up to 10 frequency sequences containing a grand total of 200 user-selected frequencies may be stored and run at will.
Level Sweep	User selected end points in dBm (600 or 150). dB/STEP keyed-in .05 dB to 20.00 dB. Sweep direction determined by selection of start and stop levels.

B. SQUAREWAVE

Frequency Range	1 Hz to 50 kHz
Risetime	less than 1 microsecond, controlled by 3-pole linear-phase filter.

C. TONEBURST

Frequency Range	1.0 Hz to 102.39 kHz
Time On and Off Adjustments	5 milliseconds to 9999.9 sec
Toneburst Off Adjustment	Burst off time attenuation from 5 to 60 dB in 5 dB increments

D. SINE/STEP

Frequency Range	1.0 Hz to 102.39 kHz
Sine On Adjustment	5 milliseconds to 9999.9 sec
Step On Adjustment	5 milliseconds to 9999.9 sec

E. SMPTE IMD

IMD Residual Distortion	less than .001%

F. GENERAL

Maximum Output Balanced or Unbalanced (one side grounded)	30.65 dBm/600 ohm load loaded 30.00 dBm/600 ohms, both channels 30.00 dBm/150 ohm load 24.00 dBm/150 ohms, both channels loaded
Maximum Open Circuit Voltage	28.6 V
Minimum Level	-90 dBm (24.5 microVolts)
THD at Maximum Output	less than .0008% 10 Hz to 20 kHz less than .0015% to 50 kHz .008% to 100 kHz
Flatness	.1 dB 10 Hz to 20 kHz .15 dB to 100 kHz
Level Accuracy	.2 dB at mid-band
Level Resolution	.05 dB
Source Resistance Tolerance	± .5% (-0.35% both channels loaded) with 600 ohms ± 2% (-5.6% both channels loaded) with 150 ohms ± 3% with 50 ohms
Selectable Load Resistance	Key-in 50 ohms to 99,999 kohms
Balance	greater than 120 dB; floating, DC coupled
Separation	greater than 100 dB to 20 kHz 80 dB to 100 kHz, balanced load. Single-ended load reduces separation 20dB.
Sync Output	5V positive going squarewave. Follows Lo Freq on IMD and Burst Envelope on Burst or Sine/Step.

De-Emphasis	75 microseconds, 25 microseconds, 50 microseconds, or 10 microseconds. Applies to all functions including IMD, Square Waves, Tone Burst, and Sine/Step.
De-Emphasis Accuracy	.02 dB

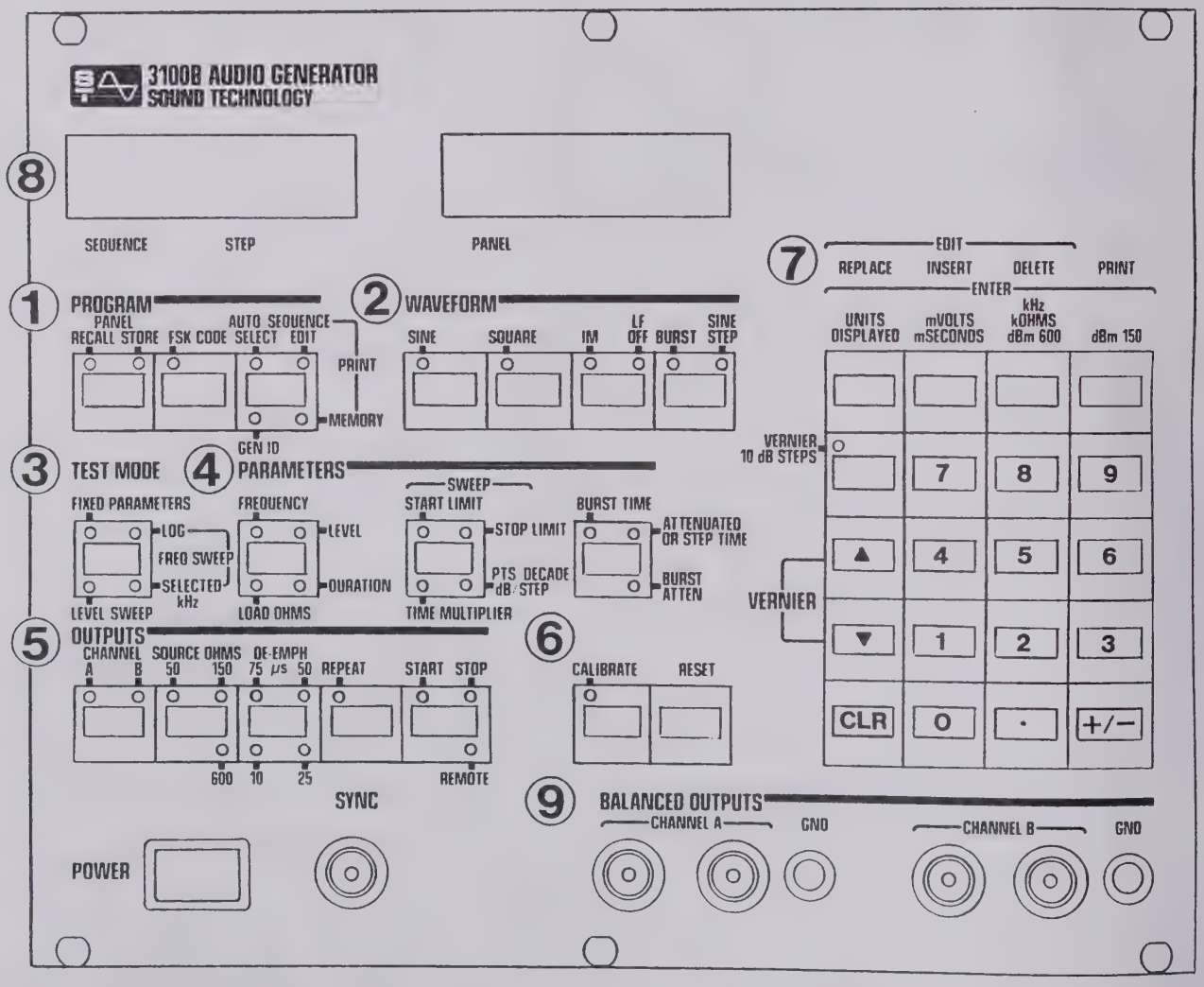


Figure 1. 3100B Generator Front Panel

1-3 FRONT PANEL FAMILIARIZATION

The front panel of the 3100B can be best understood by dividing the panel into 9 functional areas as shown in Figure 1, page 1-4:

1. PROGRAMMING GROUP: Allows user to store and recall up to 91 panel set-ups. All data previously entered into the panel is stored. For instance, let's say you had previously set up the parameters for Frequency and Level sweeps. Now you are storing the panel in the Fixed Parameters Mode. All of those previously entered sweep parameters are also stored.

This group also permits building up to 16 Automatic Sequences, each of which may contain up to 80 stored panel set-ups in any order. Printing of any Auto Sequence or the entire contents of memory is possible. Also, FSK codes can be entered to control the companion 3200A/B. A generator ID number may be entered, which will transmit at the start of any of the Auto Sequences.

PLEASE READ SECTION 3-10 OF THIS MANUAL PRIOR TO INPUTTING GENERATOR ID NUMBER TO AVOID ACCIDENTALLY ACTIVATING PASSWORD PROTECTION

2. WAVEFORM GROUP: Allows user to select type of waveform (sinewave, squarewave, SMPTE intermodulation test signal, toneburst and sine/step) to be generated.

3. TEST MODE SELECT: Allows user to select either fixed parameter signal, an "instrument selected" logarithnic frequency sweep, a user-defined frequency sweep or a level sweep.

4. PARAMETER GROUP: Allows user to select fixed frequency, frequencies for selected frequency sweeps, level, duration, load resistance, start and stop parameters, dB/step or points/decade for level and log frequency sweeps, separate sweep time multipliers for frequency and level sweeps, burst and sine/step configuration. The LEVEL parameter may also be used in an AUTO SEQUENCE test to offset the level (+ 20.00 to - 90.00 dB) of all panels used in the sequence.

5. OUTPUT CONFIGURATION: Allows user to select source resistance, channel(s) to be output, de-emphasis, repeat test and test start and stop.

6. CALIBRATE/RESET: Allows user to periodically recalibrate frequencies to .03% accuracy, recalibrate fixed frequencies stored in front panel memory, recalibrate frequencies stored for user-selected frequency sweeps, and reset certain functions in front panel memory.

7. KEYPAD: Allows user to input various signal parameters and programming data and allows editing of the Auto Sequence Chains and user-selected frequencies for frequency sweeps.

8. DISPLAY SECTION: Allows user to review programming input and configuration of signal being output during testing.

9. OUTPUT CONNECTORS: Two channel balanced outputs, sync connector and power switch.

Figure 1 details the division of the front panel into these functional areas. Please take a few minutes to familiarize yourself with the front panel.

1-4 REAR PANEL CONNECTORS

A. AC, POWER INPUT, FUSE, VOLTAGE SELECT CONNECTOR: This multi-purpose device is located at the upper right side of the rear panel. When the power cord supplied with the 3100B Generator is inserted in the connector a sliding plastic cover will protect the fuse and the voltage changing section of the connector. If the power cord is removed, the plastic cover can be moved to expose the fuse. TO CHANGE THE FUSE OR INPUT VOLTAGE: Lift up on the handle labeled "FUSE PULL" to release the fuse. Insert a new fuse (1.5A, 250V, slo-blo). To change the voltage select PC board: use a small hook or wire to slowly pull out the small PC board located just under the fuse. Note that as the PC board is being removed, one of the voltages etched on the board (100, 120, 220, 240) is visible and "right side up" (the same way as "Fuse Pull"). Turn the PC Board and reinsert it so the operating line voltage is visible in exactly the same manner as when the board was first removed from the connector. When the board is fully inserted, replace the fuse and slide the plastic cover back over the fuse section. Replace the line cord.

B. IEEE-488 CONNECTOR AND ADDRESS SWITCH: This is an option used to connect the 3100B Generator to the General Purpose Interface Bus (GPIB) as defined in the IEEE-488 Standard. Further details are contained in Section 6 of this manual. This port is installed even if the 3100B Generator was purchased without the optional G.P.I.B.

C. PARALLEL PRINTER PORT: This is the connector used to connect the 3100B Generator to standard computer printers.

D. RS-232 PORT: This is the connector used to connect the 3100B Generator to the RS-232 bus. Further details are contained in Section 6 of this manual.

E. REMOTE START CONNECTOR: BNC used for remote start of the generator with a contact (or transistor) closure to ground, circuit has 10 kilo ohms to +5 volts with 560 ohms protecting the active circuit.

SECTION 2

OPERATOR FAMILIARIZATION

2-1 GENERAL

This section of the manual is designed to give a new operator a quick familiarization with the 3100B Generator's operation. The steps should be followed in the order given, as many of them are sequence-dependant. Please note that the LED labels and buttons are in capital letters.

By various keypad operations the 3100B Generator can generate a single fixed parameter signal, a frequency or level sweep, and a sequence of any combination of fixed parameter signals, frequency sweeps and/or level sweeps.

Note that the 3100B Generator can be purchased in various configurations, dependent upon the options purchased. An instrument purchased without any options will not have De-emphasis, IMD, Toneburst or Sine/Step tests available. The lack of an option will be evident when the appropriate button is pushed and the LED does not light. All of these options may be purchased later and field-installed into your unit. Please contact Sound Technology, Inc. for more information.

The remainder of this Section of the manual details general procedures and detailed examples of outputting various test signals. We recommend that the first-time user read this Section with a 3100B Generator in front of him, connected to a two channel oscilloscope. Synchronize the scope externally from the 3100B SYNC output. The waveforms (especially Toneburst and Sine/Step) are easier to visualize when seen on the oscilloscope.

If both channels A and B are connected to a two channel scope, make sure the ground sides are both connected facing the same direction (either left or right). Both outputs share the same power amplifier, so grounding the left side of A Channel output and the right side of B Channel output, or vice versa, will short the amplifier output. The amplifier is protected for an indefinite short on its output, but you will lose the signal.

2-2 OUTPUTTING A FIXED PARAMETER FREQUENCY

The 3100B is designed to provide the maximum possible flexibility in configuring the type of signal to be generated by operation of the front panel controls. The recommended procedure for generation of a fixed frequency signal is as follows:

A. Turn Power Switch on. Wait for CALIBRATE LED to turn off.

B. Select Output Configuration (Channel A, Channel B, or Both).

C. Select Source Termination (50 ohms, 150 ohms, or 600 ohms).

D. Select Load Impedance (50 ohms to 99,999 kohms).

E. Select Fixed Parameter test mode.

F. Select a Waveform (Sine, Square, IM, Burst, or Sine/Step). Additional details on usage of Burst and Sine/Step Waveforms are in Sections 2-5 and 2-6.

G. Select a Frequency (10 Hz to 102.39 kHz for Sine, 10 Hz to 50 kHz for Square; frequencies are predetermined for SMPTE IM). Frequencies of 1 Hz to 9.9 Hz can be used for Sine, Burst or Square after initial operation of oscillator.

H. Select Level (maximum range of .0245 millivolts to 28.6 Volts; dependant on load and source impedance) and units of measure (V, milli-Volts, dBm 150 or dBm 600).

I. Start test.

J. When viewing waveforms such as IMD, Burst, or Sine Step, the scope should be externally triggered from the SYNC output of the 3100B.

To familiarize yourself with these procedures we recommend you input the following detailed example into the 3100B Generator. The example results in the generation of a 1 kHz Sinewave being output on two channels at 0 dBm 600. The source impedance selected is 50 ohms and the load impedance selected is 1000 kohms.

A. Turn Power Switch on.

B. Select the configuration of the Output. Locate the OUTPUTS Group and the CHANNEL Select button. Press the CHANNEL select button until the A LED is lit.

C. Select your Source Termination. Locate the OUTPUTS Group and the SOURCE OHMS Selection button. Press the SOURCE OHMS until the 50 LED is lit.

D. Select your Load Impedance. Locate the PARAMETERS Group and the button with the LOAD OHMS LED. Press the button until the LOAD OHMS LED is lit. Press the "1", "0", "0", "0", and kHz/kOHMS/dBm600 keypad buttons. Notice that "1000.0 kOhm" will be displayed on the right display.

E. Locate the TEST MODE button. Press the button until the FIXED PARAMETERS LED is lit.

F. Select a Waveform. Locate the SINE LED within the WAVEFORM Group. Press the button and the SINE LED will light.

G. Select the Frequency. Locate the PARAMETERS Group and the FREQUENCY LED. Press the button until the FREQUENCY LED is lit. Go to the keypad and press the "1" and kHz/kOHMS/dBm 600 buttons in the keyboard. Notice the "1.0000 kHz" will be displayed on the right display. The generator has now been programmed to output a 1 kHz signal.

H. Select the Signal Level. Locate the PARAMETERS Group and the LEVEL LED. Press the button until the LEVEL LED is lit. Go to the keypad and press the "0" and the kHz/kohms/dBm 600 buttons. Notice that the left display will indicate "0.00 dBm 600." The generator has now been configured to output a 0 dBm 600 signal (0.775V).

I. Start the Output. Locate the TEST START LED in the OUTPUT Group. Press the button until the TEST START LED

is lit. Now a continuous signal is being generated until you press the TEST START button again (and the LED registers TEST STOP).

2-3 OUTPUTTING A LOG FREQUENCY SWEEP

The recommended procedure for generation of a frequency sweep is as follows:

A. Turn Power Switch on.

B. Select the Output configuration (Channel A, Channel B, or Channels A and B), Source Impedance (50 ohms, 150 ohms, or 600 ohms) and Load Impedance (50 ohms to 99,999 kOhms).

C. Select Frequency Sweep test mode.

D. Select Level (.0245 milliVolts to 28.6V; dependent on load and source impedance) and unit of measure.

E. Select Start Frequency (10 Hz to 102.39 kHz) and Stop Frequency (10 Hz to 102.39 kHz). This determines the direction of the sweep.

F. Select the number of Points-per-Decade (4 to 255).

G. Select the Speed of the sweep (fastest sweep = 1; slowest sweep = 999).

H. Select De-emphasis (none, 75 microseconds, 50 microseconds, 25 microseconds, or 10 microseconds) (De-emphasis is purchased as an option on the 3100B Generator and may not be available on your unit).

I. Select either a Single Sweep or a Repeating Sweep.

J. Start the Sweep.

To familiarize yourself with these procedures we recommend you input the following detailed example into the 3100B Generator. The example results in the generation of a 10 Hz to 100 kHz frequency sweep with 10 points-per-decade and 0 dBm 600 level. The sweep will be performed at 1/6 of fastest sweep time available and be output on two channels. The source impedance selected is 50 ohms and the load impedance selected is 1000 kOhms.

A. Turn Power Switch on.

B. Select the Configuration of the Output. Locate the OUTPUTS Group and the CHANNEL Select button. Press the CHANNEL Select button until A LED and B LED are both lit.

C. Select your Source Termination. Locate the OUTPUTS Group and the SOURCE OHMS Selection button. Press the SOURCE OHMS until the 50 LED is lit.

D. Select your Load Impedance. Locate the PARAMETERS Group and the button with the LOAD OHMS LED. Press the button until the LOAD OHMS LED is lit. Press the "1", "0", "0", "0", and kHz/kOhms/dBm 600 keypad buttons. Notice that "1000.0 kOhm" will be displayed on the right display.

E. Locate the TEST MODE button. Press the button until the FREQUENCY SWEEP LED is lit. Please note that the SINE LED will light as SINE is automatically selected. Frequency sweeps are only available with the Sine waveform.

F. Select the Signal Level. Locate the PARAMETERS Group and the LEVEL LED. Press the button until the LEVEL LED is lit. Go to the keypad and press the "0" and the kHz/kOhms/dBm 600 keypad buttons. Notice that the left display will indicate "0.00 dBm 600." The generator has now been programmed to output a 0 dBm 600 signal.

G. Select the starting and stopping frequencies for the sweep. Locate the SWEEP button in the PARAMETERS Group. Press the button until the START LED is lit. Press the "1", "0" and the UNITS DISPLAYED buttons on the keypad. The right display will indicate "10.000 Hz." Press the SWEEP button in the PARAMETERS Group until the STOP LED is lit. Press the "1", "0", "0" and kHz/kOhms/dBm 600 buttons in the keypad. The right display will indicate "100.00 kHz." You can sweep from high to low frequency or from low to high frequency.

H. Select the number of points-per-decade. Locate the SWEEP button in th PARAMETERS Group. Press the button until the PTS/DECADE LED is lit. Press the "1", "0" and UNITS DISPLAYED buttons on the keypad. The right display will indicate "10 P/D."

I. Select the speed of the sweep. Locate the SWEEP button in the PARAMETERS Group. Press the button until the SWEEP TIME MULTIPLIER is lit. Press the "6" and UNITS DISPLAYED buttons on the keypad. The left display will indicate "6".

J. If your unit has the De-emphasis option, push this button until the last LED (10 uS) is out.

K. Select either a single sweep or a repeating sweep. Locate the button with the REPEAT LED indicator in the OUTPUT Group. Press the button until the REPEAT LED is not lit.

L. Start the output. Locate the TEST START LED in the OUTPUT Group. Press the button until the TEST START LED is lit. The right display will indicate what frequency is being output. The left display will indicate the level of the signal. The sweep will take approximately 7 seconds.

The sweep time multiplier will be dependent upon the measurement speed of the analyzer being used with the 3100B. A set of time multiplier guidelines for the 3200A/B analyzer is contained in Appendix 3, page A-8. The operator must also coordinate the number of points-per-decade being generated with the number of points-per-decade that the anlayzer will be measuring. A detailed discussion of co-ordinating the 3200A/B analyzer with the 3100B generator is contained in the 3200A/B Analyzer Operator's Manual.

2-4 OUTPUTTING A USER-SELECTED FREQUENCY SWEEP

In this position of the TEST MODE switch, you may enter as many as 200 frequencies for a sweep. A number between 01 and 10 will appear on the left side of the left-hand display indicating the "sequence number". To the right of this display appears a number indicating the step number in the sequence. The step may be incremented or decremented with the VERNIER buttons. In the right-hand display you will notice that the kHz symbol has

Addenda to Section 2-4, 3100B Operator's Manual

1. The User-Selected Frequency Sweep will start at the current step number in the selected sequence. Before running the sweep, remember to return that number to the first (or desired starting) step number. Do this by pressing the "down" vernier or by continuing to advance the step. It will roll over to position 1 after encountering a blank, "---", which indicates the end of the sequence.

2. The companion 3200 Analyzer needs to be told the number of points per decade for a frequency sweep. This applies to User-Selected as well on Log-Frequency Sweeps. The "points per decade" must be high enough to accomodate the two adjacent frequencies which, with the higher frequency divided by the lower, have the smallest ratio. For example, take the sequence: 1kHz, 2kHz, 5kHz, 7kHz, 10kHz, 11kHz, 12kHz, 13kHz, 15kHz, 20kHz.

   The corresponding ratios are 2 (2kHz/1kHz), 2.5, 1.4, 1.43, 1.1, 1.09, 1.08 (13kHz/12kHz), 1.15 and 1.33. The lowest ratio of adjacent frequencies occurs at 12 and 13kHz. The equivalent maximum points-per-decade is calculated by dividing 1 by the log of this minimum ratio.

$$\text{PTS/DECADE} = \frac{1}{\log\ (13/12)} = 28.8$$

   Use the next higher integer number, 29.

appeared. Pick a step number, switch the first PARAMETER button to FREQUENCY, and key in the desired frequency - but always in kHz. The EDIT buttons are used for entry here, and so the units (kHz) must always be the same. Enter 50 Hz as .05 kHz, etc. Frequencies may be entered in any order.

Now a word about the number of steps and sequences. If you choose to have 200 frequencies in a single sequence, you cannot use the other 9 sequences - no room is left in the memory! The firmware allows 10 sequences and 200 frequencies. You can allocate the 200 frequencies any way you want among the 10 sequences. "---" appears in the right-hand display if a sequence step is advanced past the end of the sequence, or you exceed the memory inputting a new frequency. Once in this mode, press START and your own selected frequency sweep will run.

All the other instructions concerning LOG Sweep can be ignored except SWEEP TIME MULTIPLIER. The same timing applies. If you want to go back to sequence selection, just push the TEST MODE switch again. It will stay at SELECTED kHz and the next entry in the keypad will select a sequence number. Now, to enter frequencies again press the first PARAMETER button to select FREQUENCY.

When you store frequencies in this mode they are automatically calibrated. If the 3100B has been out of action for a while and you want the most accurate frequencies emitted, press CALIBRATE with the START/STOP switch in the stop position and the TEST MODE switch in FREQ SWEEP - SELECTED or the AUTO SEQUENCE switch in any on position, in which case all fixed-frequency, stored panels will be calibrated as well.

2-5 OUTPUTTING A LEVEL SWEEP

The recommended procedure for generation of a level sweep is as follows:

A. Turn Power Switch on.

B. Select the Output Configuration (A Channel, B Channel, or A and B Channel), Load Impedance (50 ohms to 99,999 kOhms) and Source Termination (50 ohms, 150 ohms, or 600 ohms).

C. Select Level Sweep mode.

D. Select Frequency (10 Hz to 102.39 kHz) or inter-modulation signal waveform (low frequency on or off).

E. Select Starting Level (maximum range of -90 dBm 600 to 30.65 dBm 600, dependant upon load and source impedance) and unit of measure (dBm 150 or dBm 600).

F. Select Stopping Level (maximum range of -90 dBm 600 to 30.65 dBm 600, dependant upon load and source impedance) and unit of measure (dBm 150 or dBm 600).

G. Select the Resolution of sweep (.05 dB/Step to 20 dB/Step).

H. Select the Speed of the sweep (fastest sweep = 1; slowest sweep = 999).

I. Select Single or Repeating sweep. **IMPORTANT** Do not allow the 3100B Generator to continuously output level sweeps for a long period of time. It is possible to leave the 3100B in REPEAT sweep condition and wear out the output attenuator relays. It is possible to perform more than 100 sweeps per minute if the 3100B generator is allowed to remain in a REPEAT sweep condition.

J. Start the sweep.

To familiarize yourself with these procedures we recommend you input the following detailed example into the 3100B Generator. The example results in the generation of a repeating -12 dBm 600 to 12 dBm 600 level sweep with 2.00 dB per step at 400 Hz. The sweep will be output at 1/6 of the fastest sweep time available and be output on two channels. The source impedance selected is 50 ohms and the load impedance selected is 1000 kOhms.

A. Turn Power Switch on.

B. Select the Configuration of the Output. Locate the OUTPUT Group and CHANNEL Select button. Press the CHANNEL Select button until A LED and B LED are lit. Select your Source Termination. Locate the SOURCE OHMS button in the OUTPUTS Group. Press SOURCE OHMS until the 50 LED is lit. Select your Load Impedance. Locate the LOAD OHMS LED in the PARAMETERS Group. Press the button until the LOAD OHMS LED is lit. Press the "1", "0", "0", "0" and kHz/kOhms/dBm 600 keypad buttons. Notice that the "1000.0 kOhms" will be displayed on the right display.

C. Press the TEST MODE button until the LEVEL SWEEP LED is lit.

D. Select the frequency by pressing the button in the PARAMETERS Group until the FREQUENCY LED is lit. Press the "4", "0", "0" and UNITS DISPLAYED buttons on the keypad (400 Hz). The right display will indicate "400.00 Hz."

E. Select the starting level. Locate the SWEEP button in the PARAMETERS Group. Press the button until the START LED is lit. Press the "1", "2", "+/-" (change signs) and kHz/kOhms/dBm 600 buttons on the keypad. The left display will indicate "-12.00 dBm 600."

F. Select the stop level. Press the SWEEP button until the STOP LED is lit. Press "1", "2" and kHz/kOhms/dBm 600 buttons on the keypad. The left display will indicate "12.00 dBm 600."

G. Select the resolution for the level sweep. Locate the SWEEP button in the PARAMETERS Group. Press the button until the dB/STEP LED is lit. Press the "2" and UNITS DISPLAYED buttons on the keypad. The left display will indicate "02.00 dB."

H. Select the speed of the sweep. Locate the SWEEP button in the PARAMETERS Group. Press the button until the SWEEP TIME MULTIPLIER LED is lit. Press the "6" and UNITS DISPLAYED buttons on the keypad. The left display will indicate "6."

I. Locate the button with the REPEAT LED indicator. Press the button until the REPEAT LED is lit.

J. Start the output. Locate the TEST START LED in the OUTPUT Group. Press the button until the TEST START LED is lit. The right display will indicate what frequency is being output. The left display will indicate the level being output. The sweep will take approximately 7 seconds. The sweep will continue until the TEST STOP button is pressed.

The 3100B Generator will retain in memory the last fixed parameter level setting used. If you go to FIXED PARAMETERS the last fixed Level and Frequency will be indicated.

The sweep time multiplier will be dependent upon the measurement speed of the analyzer being used with the 3100B. A set of time multiplier guidelines for the 3200A/B analyzer is contained in Appendix 3, page A-8. The operator must also coordinate the sweep resolution (dB per step) being generated with the sweep resolution that the analyzer will be measuring. A detailed discussion of coordinating the 3200A/B analyzer with the 3100B generator is contained in the 3200A/B Analyzer Operator's Manual.

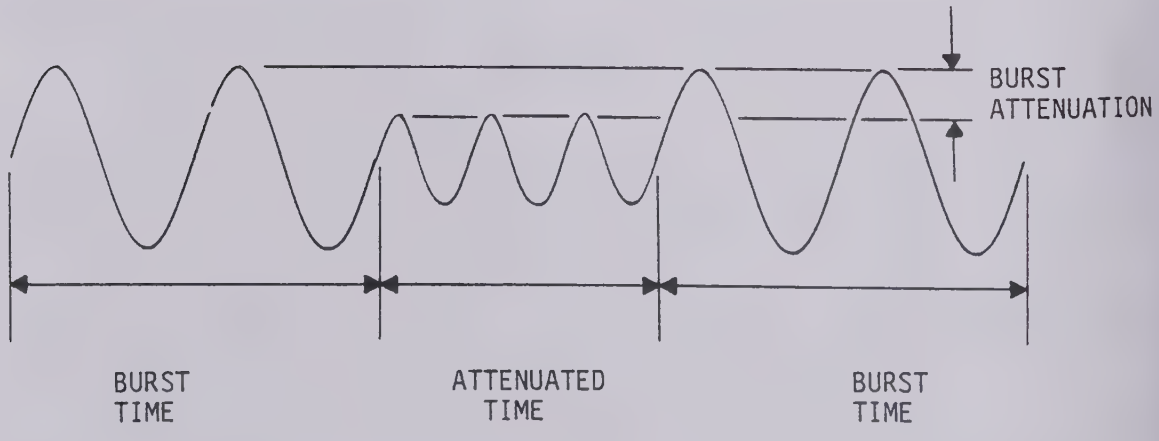


Figure 2. Toneburst Waveform

2-6 OUTPUTTING A TONEBURST WAVEFORM

The Toneburst waveform is optional on the 3100B Generator. Check the lower left corner of the rear panel of your unit to locate the option tag. If the option tag lists Option 005, your unit has the capability of Toneburst.

The 3100B Generator allows the user to select frequency, burst time on, burst time off, and burst-off attenuation level. The different characteristics of the toneburst are as shown in Figure 2, page 2-10.

The recommended procedure for generation of a Toneburst is as follows:

A. Turn Power Switch on.

B. Select Output Configuration (A Channel, B Channel or A and B Channels).

C. Select Source Termination (50 ohms, 150 ohms, or 600 ohms).

D. Select Load Impedance (50 ohms to 99,999 kOhms).

E. Select Fixed Parameter test mode.

F. Select the Burst waveform. (Burst is purchased as an option on the 3100B Generator and may not be available on your unit).

G. Select a Frequency.

H. Select a Level.

I. Select Burst Time on (5 milliseconds to 9999.9 sec).

J. Select Burst Time off (5 milliseconds to 9999.9 sec).

K. Select Burst Attenuation (5 dB to 60 dB in 5 dB increments).

L. Start Test.

To familiarize yourself with these procedures we recommend you input the following example into the 3100B Generator. Following the instructions for this example results in the

generation of a series of 40 millisecond 1 kHz Tonebursts followed by 60 millisecond 20 dB attenuated signals. The Toneburst is being output on both channels at a burst level of 2V. The source impedance selected is 50 ohms and the load impedance selected is 1000 kOhms.

A. Turn Power Switch on.

B. Select Output Configuration. Press the CHANNEL select button in the OUTPUTS Group until the A LED and B LED are lit.

C. Select Source Termination. Press the SOURCE OHMS button in the OUTPUTS Group until the 50 LED is lit.

D. Select Load Impedance. Locate the button in the PARAMETERS Group with the LOAD OHMS LED. Press the button until the LOAD OHMS LED is lit. Press the "1", "0", "0", "0" and kHz/kOhms/dBm 600 button in the keypad. Notice the right display will indicate "1000.0 kOhms."

E. Select Fixed Parameter test mode. Locate the TEST MODE button. Press the button until the FIXED PARAMETERS LED is lit.

F. Select Toneburst waveform. Locate the BURST LED in the WAVEFORM Group. Press button until the BURST LED is lit.

G. Select the Frequency. Locate the PARAMETERS Group and the FREQUENCY LED is lit. Press the "1" and kHz/kOhms/dBm 600 buttons on the keypad. Notice the right display will indicate "1.0000 kHz."

H. Select the Level. Locate the PARAMETERS Groups and the FREQUENCY LED. Press the button until the LEVEL LED is lit. Press the "2" and UNITS DISPLAYED buttons on the keypad. Notice the left display will indicate "2.0000V."

I. Select Burst Time on. Locate the BURST TIME LED in the PARAMETERS Group. Press the button until the BURST TIME LED is lit. Press the "4", "0" and the milliVOLTS/mSECONDS buttons on the keypad. Notice the right display will indicate "0.040 sec."

J. Select Burst Time off. Press the same button as in I above until the ATTENUATED OR STEP TIME LED is lit. Press the "6", "0" and the milliVOLTS/mSECONDS buttons in the keypad. Notice the right display will indicate "0.060 sec."

K. Select Burst Attenuation. Press the same button as in J above until the BURST ATTN LED is lit. Press the "2", "0" and UNITS DISPLAYED buttons on the keypad. Notice the left display will indicate "20 dB."

L. Start Output of Signal. Press the TEST button in the OUTPUTS Group until the START LED is lit.

2-7 OUTPUTTING A SINE/STEP WAVEFORM

The Sine/Step waveform is optional on the 3100B Generator. Check the lower left corner of the rear panel of your unit to locate the option tag. If the option tag lists Option 005, your unit has the capability of generating Sine/Step signals.

The 3100B Generator allows the user to output a sinewave burst followed by a D.C. step signal equal to the peak amplitude of the sinewave. The user selects frequency, duration of sinewave and duration of D.C. step signal. This waveform allows the user to analyze the effects of time delay distortion in steep slope low pass filters. The sinewave burst will accumulate maximum time delay while the D.C. step signal will accumulate minimal time delay. This test signal is used to detect problems resulting from the sinewave coinciding with the beginning of the DC step signal at the filter's output (overshoot).

This test signal is also useful as a polarity test.

The different characteristics of the Sine/Step waveform are as follows:

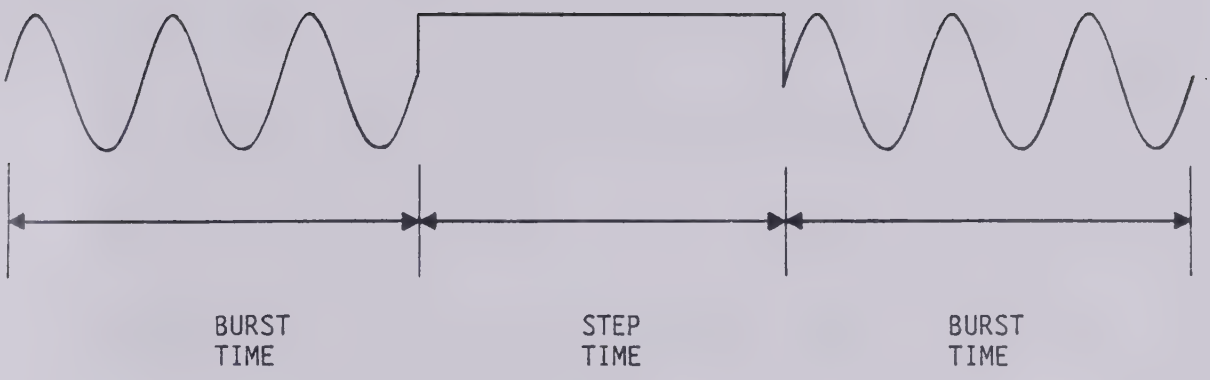


Figure 3. Sine/Step Waveform

The recommended procedure for generation of a Sine/Step waveform is as follows:

A. Turn Power Switch on.

B. Select Output Configuration. (A Channel, B Channel or A and B Channels).

C. Select Source Termination (50 ohms, 150 ohms or 600 ohms).

D. Select Load Impedance (50 ohms to 99,999 kOhms).

E. Select Fixed Parameter test mode.

F. Select the Sine/Step waveform.

G. Select a Frequency.

H. Select a Level.

I. Select Duration of Sinewave.

J. Select Duration of D.C. step signal.

K. Start Test.

To familiarize yourself with these procedures we recommend you input the following examples into the 3100B Generator. The example results in the generation of a series of 40 millisecond 1 kHz Sinewaves followed by 80 milliseconds D.C. step signals. The Sine/Step is being output on two channels at a 2V level. The source impedance selected is 50 ohms and the load impedance selected is 1000 kOhms.

A. Turn Power Switch on.

B. Select Output Configuration. Press the Channel select button in the OUTPUTS Group until the A LED and B LED are lit.

C. Select Source Termination. Press the SOURCE OHMS button in the OUTPUTS Group until the 50 LED is lit.

D. Select Load Impedance. Locate the button in the PARAMETERS Group with the LOAD OHMS LED. Press the button until the LOAD OHMS LED is lit. Press the "1", "0", "0", "0" and kHz/kOhms/dBm 600 button on the keypad. Notice the right display will indicate "1000.0 kOhms."

E. Select Fixed Parameter test mode. Locate the TEST MODE button. Press the button until the SINE STEP LED is lit.

F. Select Sine/Step waveform. Locate the SINE STEP LED in the WAVEFORM Group. Press button until the SINE STEP LED is lit.

G. Select the Frequency. Locate the PARAMETERS Group and the FREQUENCY LED. Press the button until the FREQUENCY LED is lit. Press the "1" and "kHz" buttons on the keypad. Notice the right display will indicate "1.0000 kHz."

H. Select the Level. Press the same button in the PARAMETERS Group as in G above until the LEVEL LED is lit. Press the "2" and UNITS DISPLAYED buttons in the keypad. Notice the left display will indicate "2.0000V."

I. Select Duration of Sinewave. Locate the BURST TIME LED in the PARAMETERS Group. Press the button until the BURST TIME LED is lit. Press the "4", "0", and milliVOLTS/milliSECONDS buttons on the keypad. Notice the right display will indicate "0.040 sec."

J. Select Duration of D.C. offset. Press the same button as in I above until the STEP TIME LED is lit. Press the "8", "0", and milliVOLTS/milliSECONDS buttons on the keypad. Notice the right display will indicate "0.080 sec."

K. Start Output of Signal. Press the START button in the OUTPUTS Group until the START LED is lit.

2-8 USE OF VERNIER

The 3100B Generator has the capability of adjusting an entered frequency or level parameter by using a built-in vernier. Located in the keyboard section there is a button with a VERNIER/10dB STEPS LED. When this LED is NOT lit, the user may adjust the previously entered frequency (.01% steps)or level (.05% dB steps) either up or down by pressing one of the two VERNIER buttons in the keyboard. The usage of the VERNIER button eliminates the need to enter a new frequency or level on the keyboard.

The vernier allows the user to adjust the frequency of sinewaves and squarewaves. The frequency vernier can be accessed whenever the 3100B Generator is in FIXED PARAMETER or LEVEL SWEEP mode and the FREQUENCY LED is lit. To operate the vernier, press either of the VERNIER buttons in the keyboard. The changes in frequency are indicated in the right display. The level vernier

can be used with any waveform. The level vernier can be accessed whenever the 3100B Generator is in FIXED PARAMETER or FREQUENCY SWEEP test mode and the LEVEL LED is lit. To operate the vernier, press either of the VERNIER buttons in the keyboard. The changes in level are indicated in the left display.

2-9 USE OF 10dB STEP FUNCTION

The 3100B has the capability of automatically adjusting the previously entered level by 10dB increments by pressing a button. The 3100B Generator will automatically adjust the level settings in any unit of measure. The 3100B Generator will accept level settings in Volts, milliVolts, dBm 150 or dBm 600. The 10dB STEP function can be used with any waveform. The 10dB STEP function can be accessed whenever the 3100B Generator is in FIXED PARAMETER or FREQUENCY SWEEP test mode and the LEVEL LED is lit. Within the keyboard section of the 3100B Generator there is a button with a VERNIER/10dB STEP LED. When the LED is lit, the 10dB STEP function is available. When the LED is not lit, the VERNIER function is available. To operate the 10dB STEP function, press either of the VERNIER buttons in the keyboard. The change in level will be indicated in the left display.

NOTE: Another use for this button is to change the frequency vernier from .01%/step to 0.1%/step.

SECTION 3

FRONT PANEL PROGRAMMABILITY

3-1 GENERAL

The 3100B Generator may be programmed by using the built-in memory and front panel controls. No external computer or controller is needed, the only necessary component is the 3100B Generator. The programming requires no prior knowledge of programming or software languages. With a few keyboard entries, up to 91 fixed parameter waveforms, frequency sweeps, or level sweeps can be stored into memory. Any of these memory positions can then be linked together into as many as 16 auto sequence chains, each chain consisting of up to 80 fixed parameters and/or sweeps.

The front panel programmability accesses all of the capabilities of the 3100B Generator. Any signals that can be generated by using the front panel controls may also be stored and used as a preprogrammed signal. With the exception of toneburst and Sine/Step waveforms, any of the preprogrammed signals can then be linked into auto sequences. (If the Toneburst or Sine/Step waveforms are included in an auto sequence, the 3100B Generator will skip the waveform and continue the auto-sequence). The linked signals are assigned a two-digit code and recalled by entry of this code. For example, a sequence of a combination of up to 80 frequency sweeps, level sweeps, fixed frequency or fixed level signals can be run by entering the assigned two-digit code and pressing START TEST. The user can

stipulate all of the normal parameters (i.e., frequency, level, sweep start and stop limits, output configuration, points-per-decade, signal duration, etc.) for each of the 91 front panel set-ups. The operator has the ability to devise and run elaborate test procedures with minimal entry.

3-2 STORING A FRONT PANEL SET-UP

The procedure for storing a front panel set-up involves setting-up the Generator front panel for the desired signal exactly as you would do in the manual mode (see Section 2 of this manual), inputting an operation code, assigning a memory location number (1 through 91), and storing the panel set-up.

The operation code is a ten-digit number utilized for remote control of the Sound Technology Model 3200A/B Audio Analyzer. The control of the 3200A/B Analyzer is accomplished via a series of coded frequency bursts transmitted through the audio path being tested. This technique is referred to as frequency shift keying, or "FSK."

Op-codes fall into four categories:

1. Those used to program the 3200 for a particular test (leading number 1 through 4), which are sent at the beginning of the panel set-up (or test).

2. Those we call pure op-codes, (leading number 5 or larger) which are used to command the 3200 to do things like clear memory or print. They are sent at the fixed level specified in the panel, but the rest of the panel set-up is ignored. Only the op-code is sent for that panel.

3. If the leading panel in an auto sequence contains a leading zero (such as 00000 10000) no op-codes are sent for the entire sequence.

4. A panel set-up stored with an all-zero op-code (i.e. 00000 00000) is lost. It is effectively erased and cannot be recalled manually or in a sequence. If this panel number is recalled, three dashes, " - - -", appear in the left hand display.

The operation code allows the user of the 3100B Generator to determine which type of measurement will be made by the 3200A/B Analyzer, which filters to be used, detection method, units of measure, print function, and input configuration. If the 3100B Generator is not being used with the 3200A/B Analyzer, entry of the operation code "0000010000" is still necessary.

Assuming the 3100B Generator is being used without utilizing remote control of the 3200A/B Analyzer, the method of storing a LOG frequency sweep would be as follows:

A. Set-up the front panel buttons as you would to output a frequency sweep. Follow the instructions in paragraph 2-3 pertaining to the detailed example, steps A through L.

B. Press the TEST MODE button until the LOG FREQUENCY SWEEP LED is lit.

C. Press the button in the PROGRAM Group until the FSK LED is lit.

D. Press the "0" and UNITS DISPLAYED buttons on the keypad. The left display will indicate "00000." Press the "1" and UNITS DISPLAYED buttons in the keypad. The right display will indicate "10000." The operation code "0000010000" is now associated with this front panel set-up.

E. Locate the PROGRAM PANEL button in the PROGRAM Group. Press the button until the STORE LED is lit.

F. Press the "1" button and UNITS DISPLAYED in the keypad. The left display will indicate "1". The frequency sweep is now stored in memory position 1.

For a detailed explanation of the usage of operation codes for remote control of the 3200A/B Analyzer, refer to Section 4 of this manual. The same procedure is followed for storing a fixed parameter signal except that the duration of the signal must also be specified. Setting the duration does not apply to normal manual operation of the 3100B Generator. During manual use, a fixed signal is constantly output until the STOP button is

pressed. It is necessary to define duration of the signal since the front panel set-up may be used in an auto sequence of front panel set-ups. See Appendix 3, page A-8 for duration computation. The procedure for storing a fixed parameter front panel set-up is to set up the Generator front panel for the desired signal exactly as you would in the manual mode (see paragraphs 2-2, 2-5 and 2-6), selecting duration time (5 milliseconds to 9999.9 sec), inputting an operation code, assigning a memory location number (1 through 91), and storing the front panel set-up. It is very important that adequate time duration is provided to allow the analyzer to measure the signal. For example, to store a fixed parameter signal, follow the instructions in the example in paragraph 2-2, up to step I. Then:

A. Locate the DURATION LED in the PARAMETERS Group. Press the button until the DURATION LED is lit. Press the "1" and UNITS DISPLAYED buttons in the keypad. Notice the right display indicates "1.000 sec."

B. Press the button in the PROGRAM Group until the FSK LED is lit.

C. Press the "0" and UNITS DISPLAYED buttons in the keypad. The left display will indicate "00000". Press the "1" and UNITS DISPLAYED buttons in the keypad. The right display will indicate "10000." The operation code "0000010000" is now associated with this front panel set-up.

D. Locate the PROGRAM PANEL button in the PROGRAM Group. Press the button until the STORE LED is lit.

E. Press the "2" and UNITS DISPLAYED buttons in the keyboard. The left display will indicate "2". Now this fixed parameter signal is stored in memory position 2.

The same procedure can be followed to store up to 91 different front panel set-ups.

3-3 RUNNING A FRONT PANEL SET-UP

The procedure for running one of the previously stored front panel set-ups is to recall the panel and start the signal. All stored front panels can be reviewed by viewing the LED's and displays on the front panel or by printing the panel set-ups via a standard computer printer (see Section 3-7). For example, to review and run the front panel set-ups you have stored in paragraph E of Section 3-2 above:

A. Locate the PANEL button in the PROGRAM Group. Press the button until the RECALL LED is lit.

B. Press the "1" button and UNITS DISPLAYED on the keypad. The front panel will have the same LED's lit as when you input the original front panel set-up. By reviewing the lit LED's and the two displays you have the complete configuration of the stored panel set-up in the number 1 memory position. Press the "2" button and UNITS DISPLAYED on the keypad. The front panel will have the same LED's lit as when you input the original front panel set-up number 2. By reviewing the lit LED's and the two displays, you have the complete configuration of the stored panel set-up in number 2 memory position. You may display the load impedance in the stored panel by pressing the LOAD OHMS button in the PARAMETERS Group which displays the load impedance in the right display.

C. To start the signal, press the START button in the OUTPUTS Group until the START LED is lit. Whatever front panel set-up has been recalled from memory will define the signal generated.

3-4 MODIFYING A FRONT PANEL SET-UP STORED IN MEMORY

The procedure for modifying a front panel set-up currently in memory involves recalling the front panel set-up, inputting the desired revision, and storing the revised front panel set-up. It is essential that the front panel set-up is stored after revision or the revision will be ignored by the 3100B Generator. When the STORE LED is lit, the number of the last panel recalled

will appear in the left-hand display and need not be re-entered if you wish to store to the same location. Press UNITS DISPLAYED button to store.

Assuming you wish to modify the front panel set-up in memory position 4 to output a SQUARE waveform instead of a SINE waveform, the procedure would be as follows:

A. Locate the PANEL RECALL LED in the PROGRAM Group. Press the button until the RECALL LED is lit.

B. Press the "4" and UNITS DISPLAYED buttons in the keyboard. The displays will indicate the level and frequency of the signal of front panel set-up number 4. The LED's will indicate the other characteristics of the signal stored in front panel set-up number 4.

C. Press the appropriate buttons to revise the signal as desired. In this example, press the SQUARE button in the WAVEFORM Group.

D. Locate the SETUP STORE LED in the PROGRAM Group. Press the button until the STORE LED is lit.

E. Press the and UNITS DISPLAYED button in the keyboard. The revised front panel set-up is now stored in front panel set-up number 4 memory.

3-5 REPLACING OR DELETING A FRONT PANEL SET-UP

After storing a front panel set-up in memory the front panel set-up can be replaced by inputting a new front panel set-up into the same memory position. The procedure for replacing a front panel set-up is the same as the Procedure to store a new front panel set-up.

To delete a front panel set-up from memory, the procedure is to recall the front panel set-up, change the operation code to "00000 00000", and store the front panel set-up.

Assuming you wish to delete front panel set-up number 26, the procedure would be as follows:

A. Locate the PANEL RECALL LED in the PROGRAM Group. Press the button until the RECALL LED is lit.

B. Press the "2", "6" and UNITS DISPLAYED buttons in the keypad. The displays will indicate the level and frequency of the signal of front panel number 26. The LED's will indicate the other characteristics of the signal stored in front panel number 26.

C. Press the FSK CODE button in the PROGRAM Group until the LED is lit.

D. PRESS THE "0", UNITS DISPLAYED, "0" and UNITS DISPLAYED buttons in the keypad. The displays will indicate "00000" and "00000".

E. Locate the PANEL STORE LED in the PROGRAM Group. Press the button until the STORE LED is lit.

F. Press the UNITS DISPLAYED button in the keypad.

3-6 STORING AN AUTOMATED SEQUENCE

There are 16 memory locations available for storing auto sequences of front panel set-ups. The front panel set-ups can be linked together in any sequence and a front panel set-up can be used multiple times in an auto sequence. A front panel set-up can also be used in different auto sequences. The 16 memory locations for auto sequences are assigned the code numbers 1 through 16.

In all auto sequences, de-emphasis and load impendance selected in the first panel called in the sequence will be used for the entire sequence.

The above applies even if the first panel called is sending only an op-code.

Another useful feature is available to suppress the transmission of FSK codes during an auto sequence. As the 3100B Generator can be used with analyzers which do not have FSK

capability, it may be desirable to eliminate the generation of frequency bursts used for FSK communication. By changing the first digit in the operation code to "0" in the first front panel set-up encountered while running an auto sequence, no FSK codes will be transmitted by any front panel set-ups within the remaining auto sequence.

While in the auto sequence mode, the two displays of the 3100B Generator are divided into two, two-digit numbers and one three-digit number, the panel number. To assist you in visualizing this, please locate the AUTO SEQUENCE button in the PROGRAM Group. Press the button until the SELECT LED is lit. Note that the two displays have three sets of numbers. The first two digits in the left display is the auto sequence number (1 through 16) you are working with. The second two digits in the left display is the current step within that auto sequence (1 through 80). The three digits in the right display is the front panel set-up (1 through 91) corresponding to the current step. Assuming the display readout is 04 02 008 you know that front panel set-up number 8 is the second test signal to be generated in auto sequence number 4.

Although front panel set-ups using toneburst and sine/step waveforms can be stored, these front panel set-ups cannot be accessed through auto sequences. If a front panel set-up utilizing one of these waveforms is included within an auto-sequence, the 3100B Generator will ignore this front panel set-up and continue to the next step.

Front panel set-ups may be stored using repeating frequency and level sweeps. When a repeating sweep is encountered within an auto sequence, the sweep will be performed one time. If the user desires repeating sweeps he may enter the desired front panel set-up numerous times within the auto sequence.

The procedure to store an auto sequence is to press the AUTO SEQUENCE button until the SELECT LED is lit, key in the desired auto sequence number, press AUTO SEQUENCE again to switch to EDIT, and enter the front panel set-up numbers in whatever order the operator desires. The VERNIER buttons are used to change the STEP number.

To facilitate ease of entry and editing, the 3100B Generator uses the top row of buttons in the keypad for various editing capabilities during the creation of auto sequences or the editing of existing auto sequences. Please note the buttons marked "REPLACE", "INSERT", and "DELETE" under the "EDIT" title.

REPLACE simply replaces a newly keyed-in set-up number with the current one. INSERT moves the remainder of the chain out one step and puts the new number in the current step. DELETE removes whatever is in the current step and closes up the chain.

An automatic sequence always starts at the "current" step and stops when a panel set-up number 000 is encountered or the 80th location has been reached. A frequent error is to build a sequence, leave the step at the last number used, and then try to run the sequence. Always return the step to the point where you want to start. You can test part of a sequence by inserting a "000" set-up where you want it to stop. Later simply delete the "000".

3-7 REVIEWING AN AUTOMATED SEQUENCE

The procedure for reviewing one of the previously stored auto sequences is to recall the auto sequence and scroll through the memory locations in the auto sequence. The auto sequence can be reviewed on the displays or by printing the auto sequence via a standard computer printer (see Section 3-9). For example, to review an auto sequence you have stored in memory position 1:

A. Locate the AUTO SEQUENCE button in the PROGRAM Group. Press the button until the SELECT LED is lit.

B. Press the "1" and UNITS DISPLAYED buttons in the keypad. The first two-digit group in the left display will be "01", indicating you are working with the auto sequence number 1.

C. The displays will show three number groups, such as 01 08 009, indicating that front panel set-up number 9 will be the 8th test signal to be generated in auto-sequence 1. To review the sequencing of the front panel set-ups within auto sequence number one, use the "down" VERNIER to scroll to step one in the auto-sequence. (Note that there are 80 available steps in each auto-sequence).

As discussed in Section 3-4, the 3100B Generator has REPLACE, INSERT, and DELETE editing functions available to facilitate revisions to auto sequences.

3-8 RUNNING AN AUTOMATED SEQUENCE

The procedure for running an auto sequence is to put the 3100B Generator into auto sequence mode, recall the auto sequence desired, and start the test. For example, to run auto sequence number 1:

A. Locate the AUTO SEQUENCE button in the PROGRAM Group. Press the button until the SELECT LED is lit. Note that the displays will show three two-digit numbers. If the first two-digit group is the correct auto sequence you wish to run, step B is not necessary. If the first two-digit group is the correct auto-sequence, and the second two-digit group is the correct step for starting the auto sequence, steps B and C are not necessary.

B. Press the "1" and UNITS DISPLAYED buttons in the keypad. The first two-digit group in the left display will be "01", indicating you have recalled auto sequence number 1 from memory.

C. Review the second two-digit group in the left display. Whatever two-digit location is indicated will be the beginning step for signal generation in the auto-sequence. You can start an auto sequence from any step within the sequence. If the step number in the display is not the desired beginning step of the auto sequence, then the VERNIER buttons can be used to scroll the number to the desired beginning step.

D. Press the START button in the OUTPUTS Group. The auto-sequence will stop when it has sent the set-up in the 80th location or encounters a front panel set-up numbered "000".

E. If you find yourself in a situation requiring the same dB of level change in all panels of an auto sequence, it is not necessary to go in and modify the level of each panel set-up even if originally set up in volts. It is possible to key in a level offset for the entire sequence. While in AUTO SEQUENCE - SELECT, press the first button in the PARAMETERS group. The LEVEL LED will turn on, and then you can go to the keypad and enter the dB's of offset you desire (+ 20.00 to - 90.00 dB) in .05 dB increments. Enter the number by pressing any of the left three ENTER switches.

The offset entered will be in effect until replaced by a different offset or automatically replaced with 0 dB by turning line power off and on or by pushing the red RESET switch. If the offset value is anything except 0 dB, the Fixed PARAMETER Level LED will flash at the start of a sequence to give you a visual warning that an offset is in effect, and during the sequence the Level LED will be lit continuously. The current value of the offset is displayed whenever the Fixed PARAMETERS switch is pushed while the AUTO SEQUENCE SELECT and STOP LEDs are lit.

During a sequence, the level display shows the stored level, not the output level which is the stored level plus offset. As always, the 3100B automatically compensates for programmed load and source resistances to output the specified level.

While an auto sequence is running, if the offset value plus the level programmed in a panel exceeds the output capability of the 3100B, the sequence will stop. The 3100B will be in the following state:

- -the signal output is turned off.
- -both START and STOP LEDs are off.
- -the Function and Test Mode LEDs and the displays are normal, showing conditions at the stop.
- -the panel will appear to be frozen and will become active again only by pushing the START/STOP or RESET switches. Push the Start/Stop switch to reset the 3100B to the start state of the sequence that you were running. If you push the RESET button, the panel that was running at the time of the 'freeze' will be restored with the STOP LED on.

At the start of an automatic sequence, the 3100B will automatically generate FSK codes to send the generator ID, sequence number, and the level offset to the ST 3200B Analyzer. Before sending each Test FSK code (those codes that begin with digits 1 thru 4), the 3100B will generate an FSK code to send its panel number to the ST 3200B. Firmware in your 3200B must be revision S3205B or later for the 3200B to print the offset and panel numbers.

3-9 PRINTING MEMORY

The 3100B Generator has a parallel printer port located on the rear panel. You can attach a parallel printer to the 3100B Generator and print out the information contained in memory. For the printer to also print graphics properly from the 3200B, it must have the following capabilities:

1. 1/9 inch paper feed.
2. Condensed mode with 17.1 characters per inch.
3. Single density graphics mode with 60 dots per inch horizontally and 72 dots per inch vertically.

These capabilities are provided in many parallel-interface printers such as:

Brother M-1109
Cannon PR-1080A
Epson FX-80, MX-80, LQ-800/1000
Fujitsu DX-2000 series
Panasonic KX-P10801, KX-P1092

and are sometimes referred to as IBM Proprinter compatibility.

The procedure for obtaining a print-out of memory is:

A. Locate the AUTO SEQUENCE button in the PROGRAM Group. Press the button until the PRINT MEMORY LED is lit.
B. Press the PRINT button in the top row of the keypad.

The 3100B Generator will print two different reports listing the memory contents. The first report will provide a numerical listing of stored front panel set-ups (Figure 4) and provide a chart of the front panel set-ups contained in each auto sequence listed in the location order within the auto sequence (Figure 5). A chart is printed for each auto sequence stored in memory.

A print-out of the front panel set-ups (as shown in Figure 6) contained within one specific auto sequence can be obtained by the following procedure:

A. The EDIT or SELECT LEDS in the PROGRAM Group should be lit.

B. Use the VERNIER function to scroll the display to the step number where you wish the print-out to begin. You may start the print-out at any point within an auto-sequence.

C. Press the PRINT button in the top row of the keyboard.

GENERATOR ID :

ST 3100 STORED PANEL SETUPS

PANEL No. 1

FIXED PARAMETERS SINE 0.00 dBm-600 1.0000 kHz 2.500 Sec Dur

A&B-CH ON RS = 50 ohms RL = 600.00 ohms DE-EMPH : Off
OP-CODE 0 1 1 0 0 0 0 0 0 0

PANEL No. 20

FIXED PARAMETERS SINE 0.00 dBm-600 11.800 kHz 1.000 Sec Dur

A&B-CH ON RS = 50 ohms RL = 100.00 Kohms DE-EMPH : Off
OP-CODE 5 6 0 0 0 0 0 0 0 0

PANEL No. 21

FIXED PARAMETERS SINE 0.00 dBm-600 1.0000 kHz 4.000 Sec Dur

A-CH ON RS = 50 ohms RL = 100.00 Kohms DE-EMPH : Off
OP-CODE 1 0 1 0 0 4 1 2 0 1

PANEL No. 22

FIXED PARAMETERS SINE 0.00 dBm-600 1.0000 kHz 4.000 Sec Dur

A&B-CH TERM RS = 50 ohms RL = 100.00 Kohms DE-EMPH : Off
OP-CODE 2 2 1 1 4 1 2 0 0 0

PANEL No. 23

FIXED PARAMETERS SINE 0.00 dBm-600 1.0000 kHz 3.000 Sec Dur

A&B-CH TERM RS = 50 ohms RL = 600.00 ohms DE-EMPH : Off
OP-CODE 6 2 0 0 0 0 0 4 0 0

Figure 4. An Example of Stored Front Panel Set-ups

```
                ST 3100  STORED CHAIN TESTS

AUTO-SEQUENCE No. 2     Current Start Location    1

20      21      22      23      37      28      33      26      27      0
0       0       0       0       0       0       0       0       0       0
0       0       0       0       0       0       0       0       0       0
0       0       0       0       0       0       0       0       0       0
0       0       0       0       0       0       0       0       0       0
0       0       0       0       0       0       0       0       0       0
0       0       0       0       0       0       0       0       0       0
0       0       0       0       0       0       0       0       0       1


AUTO-SEQUENCE No. 6     Current Start Location    1

20      21      22      23      30      25      28      26      27      0
0       0       0       0       0       0       0       0       0       0
0       0       0       0       0       0       0       0       0       0
0       0       0       0       0       0       0       0       0       0
0       0       0       0       0       0       0       0       0       0
0       0       0       0       0       0       0       0       0       0
0       0       0       0       0       0       0       0       0       0
0       0       0       0       0       0       0       0       0       0
```

Figure 5. An Example of Stored Auto Sequences

```
GENERATOR ID :

                ST 3100  AUTO-SEQUENCE No. 6

PANEL No.  20

OP-CODE   5 6 0 0 0 0 0 0 0 0              0.00 dBm-600


PANEL No.  21

FIXED PARAMETERS  SINE          0.00 dBm-600  1.0000 kHz   4.000 Sec Dur

A-CH ON        RS = 50 ohms      RL = 100.00  Kohms DE-EMPH : Off
OP-CODE   1 0 1 0 0 4 1 2 0 1


PANEL No.  22

FIXED PARAMETERS  SINE          0.00 dBm-600  1.0000 kHz   4.000 Sec Dur

A&B-CH TERM    RS = 50 ohms      RL = 100.00  Kohms DE-EMPH : Off
OP-CODE   2 2 1 1 4 1 2 0 0 0


PANEL No.  23

OP-CODE   6 2 0 0 0 0 0 4 0 0              0.00 dBm-600


PANEL No.  30

FREQUENCY SWEEP    SINE          0.00 dBm-600  15.000 kHz TO 50.000 Hz
     4 Pts/Dec    40 = TIME MULT
A-CH ON        RS = 50 ohms      RL = 600.00 ohms   DE-EMPH : Off
OP-CODE   3 2 1 4 5 4 2 0 0 0


PANEL No.  25

FREQUENCY SWEEP    SINE          0.00 dBm-600  15.000 kHz TO 50.000 Hz
     4 Pts/Dec    60 = TIME MULT
A-CH ON        RS = 50 ohms      RL = 600.00 ohms   DE-EMPH : Off
OP-CODE   3 5 1 1 4 4 1 0 1 0
```

Figure 6. Current Auto Sequence

```
PANEL No.  28

FREQUENCY SWEEP     SINE          0.00 dBm-600  15.000 kHz TO 50.000 Hz
     4 Pts/Dec     35 = TIME MULT
A&B-CH ON      RS = 50 ohms      RL = 600.00 ohms    DE-EMPH : Off
OP-CODE    3 6 3 0 0 0 0 0 0 0


PANEL No.  26

OP-CODE    5 3 0 0 0 0 0 0 0 0              0.00 dBm-600


PANEL No.  27

OP-CODE    5 1 0 0 0 0 0 0 0 0              0.00 dBm-600
```

Figure 6. Current Auto Sequence (cont.)

If the print function is not operating correctly, refer to Appendix I of this manual for the printer port pin configuration of the 3100B. Although the pin configuration on the parallel port of the 3100B is the conventional configuration it is possible that a printer's pin configuration may differ. Review the pin configuration within your printer's operations manual for conformity with the 3100B pinout configuration.

3-10 PASSCODE PROTECTION OF MEMORY

The 3100B Generator has a passcode security system feature allowing protection of front panel memory. Without the correct passcode, front panel set-ups and auto sequences cannot be modified or created. The passcode is established and modified by accessing the GEN ID LED in the Programming Section of the front panel. When the 3100B Generator is shipped, the identification number is blank.

The 3100B can be operated without ever accessing the passcode protection feature. To avoid creation of passcodes never enter a generator I.D. with a preceeding minus sign. Any generator identification number without a preceding minus sign can be used and passcode protection will not be activated. If you want to use the passcode protection access the generator identification number by lighting the GEN ID LED. Enter any 4-digit identification number with a preceding minus (-) sign and you have specified the 4-digit identification number as a security passcode. After completing or modifying the front panel memory you can secure this information by inputting a different generator identification number. Entering a different generator identification number is necessary as the 3100B Generator will retain the original passcode generator identification number in non-volatile memory until this identification number is changed. If the passcode generator identification number is not residing in memory, the SETUP STORE and CHAIN LED's on the front panel are not accessible. When in this configuration the front panel set-ups and automated sequences cannot be modified.

To eliminate the passcode security, input the 4-digit passcode generator identification number with the preceding digit being the number "0". Passcode security can be reestablished by entering any 4-digit identification number with a preceding minus sign. The last 4-digit identification number preceded by a minus sign will be the current passcode.

It is essential that generator identification numbers do not use a preceding minus sign unless the passcode security system is being activated. As in the case of any passcode, it is important that the passcode be retained in a safe place. If you lose the passcode it may be necessary to return the 3100B Generator to the factory to remove the passcode protection.

SECTION 4

FREQUENCY SHIFT KEYING

4-1 GENERAL

The 3100B Generator has the ability to operate the 3200A/B Analyzer under remote control. This control is accomplished via a series of coded frequency bursts transmitted through the audio path being tested. This technique is referred to as frequency shift keying or "FSK".

The 3100B Generator uses a ten-digit operation code (or FSK code) linked to each front panel set-up stored in the 3100B Generator to control the 3200A/B Analyzer. The operation code allows the user to determine which type of measurement will be made, filter configuration, detection method, units of measurement, input configuration, and control over print functions of the 3200A/B Analyzer.

The codes used to control the 3200B Analyzers are listed in Appendix 4. The first digit defines the generic use of the panel's information (op code only, noise test, frequency or level sweep, etc). The second digit defines the measurement to be performed (level, ratio, IMD, phase, etc.). The third digit defines the channel to be used. The fourth digit defines the high pass filter to be used. The fifth digit describes the low pass filter. This completes the five digits on the 'A' display (the left hand LED display). On the 'B' display, the sixth digit describes weighting filters to be used. The seventh digit

describes detection circuits. The eighth, level units and the ninth, ThD units. The tenth and last digit is used to describe miscellaneous functions such as Autoranging and setting reference level.

4-2 HOW TO INSERT AN OP CODE (FSK CODE)

Usually, designing and inserting an op code is the last step before storing a panel into memory. It is also quite common to modify an op code in a panel after it has already been stored.

A. Determine what measurements you intend to perform. After determining what measurement is desired, you can design the appropriate generator panel op code. Since the op code is part of the generator panel, it is necessary to know what measurement will be performed with each stored generator panel. Assuming you want to set a reference at 1 kHz, 0 dBm/600 signal, the following procedure would apply:

B. Design and load the appropriate generator panel to give the analyzer the frequency and level necessary to perform the function described in A above. In this instance a Fixed Parameter panel having a frequency of 1 kHz and a level of 0dBm/600 with a time duration of 2000 msec should suffice. Key in all of the applicable numbers and functions (channel select, etc) for this panel.

C. Referring to Figure 7, the appropriate op code for our purposes would be: 11100-41201. Storing this number is as follows:

1. Select the FSK CODE switch (located to the right of Store/Recall under the Programming section). FSK CODE LED should be lit.

2. In loading op codes (FSK CODES), you key-in the A display first (the first five digits of your op code), then the B display. So, for this example, you key-in "11100" and then "enter" which is in the upper left hand corner of the key pad (the button is actually titled UNITS DISPLAYED). Then you key-in the second set of five numbers: 41201 and then press enter. We have now stored the ten digit op code into memory. You should see 10100 in the left display. Usually at this point we then store the entire panel, including the op code, into a front panel memory location - a number from one to ninety-one. The storage of front panel set-ups are described in Section 3-2.

4-3 DESIGNING SINGLE PANEL OP CODES

Op code guides are shown in Appendix 4. One for the 3200A/B, the other for the 3200B.

1. Let's examine the example panel described in Section 4-2. (For the following op code examples refer to Figure 7.) The breakdown of the ten digit op code is as follows:

digit	description
1	Normal/
0	Flat Level (3200A only)
1	A channel
0	no change
0	no change
4	no weighting
1	AVG detection
2	dBm/600 ohms
0	N/A
1	set reference level

The op code is doing everything you would manually do with the analyzer when making the same measurement (with the exception that you don't have to tell the analyzer to Start Inputs ...the op code does that automatically). The op codes were designed to strobe in set-up commands exactly as though you were pushing the front panel buttons of the analyzer.

2. Let's design another op code, this one attached to a generator front panel set-up that consists of 2000 msec of terminated A&B channels. We want to measure the residual noise of a device under test with this panel. An appropriate op code would be"2211441000":

digit	description
2	Noise test
2	Ratio
1	A channel
1	22 Hz HP filter
4	80 kHz LP filter
4	no weighting
1	AVG detection
0	N/A (preset by test)
0	N/A (preset by test)
0	N/A

3. Next, we'll design an op code for measuring the phase error in degrees of an incoming frequency sweep. That op code would be as follows: 36300-00000.

digit	description
3	Frequency sweep
6	Phase error in degrees
3	A&B channel (not nec - it would default there)
0	N/A (preset by test)
0	N/A (preset by test)
0	N/A (preset by test)
0	" " " "
0	" " " "
0	" " " "
0	" " " "

4-4 PURE OP CODES

Abbreviated descriptions of these codes are also included in the charts of Appendix 4. So far we have described op codes directly applicable to generator panel set-ups: fixed parameters (single sine waves), frequency sweeps, level sweeps, etc. There are other instances where we want to command the analyzer to perform a function, but where the command is not applicable to a generator function or set-up (print, set dB/step, Stop, etc). These instances are delineated and implemented as "pure op codes". A listing and brief description of pure op codes is as follows. See Figure 7 for additional reference.

pure op code (3200A)	description
50000-00000	Print data. Using this code, the analyzer will print and then stay in FSK mode.
51000-00000	Print data and go to Local. Same as 50000-00000 except after printing, analyzer goes back to local control.
52000-00000	Start. This code will cause the analyzer to begin measuring the input signal and storing data.

pure op code (3200A cont'd)	description
53000-00000	Stop. Stops the analysis circuits. This is generally the last command before "print". If a new test number is wanted for a test using the same op-code that was just used, use this "Stop" code just before the new test is to begin.
54000-00000	Go to Local control.
55000-00000	Any op-code will lock out all front panel controls except RESET. This one also locks out RESET.
56000-00000	Clears analyzer memory. Normally used at start of an auto sequence.
61000-nnnn0	Sets dB/step. Range is 0005 (.05dB) to 2000 (20dB). Used to set level change at which data will be stored.
62000-nnn00	Sets points/decade. Range is 004 to 255. Used to set frequency change at which data will be stored.
64000-00000	Initiate self-check routine in the analyzer.

pure-op codes (3200B)	description
50000-00000	Print data. Using this code, the analyzer will print and then stay in FSK mode.
51000-00000	Print data and go to Local. Same as 50000-00000 except after printing, analyzer goes back to local control.
52000-00000	Start. This code will cause the analyzer to begin measuring the input signal and storing data.
53000-00000	Stop. Stops the analysis circuits. This is generally the last command before "print".
54000-00000	Go to local control.
55000-00000	Any op-code will lock out all front panel controls except RESET. This one also locks out RESET.
56000-00000	Clears analyzer memory. Normally used at start of an auto sequence. After the first op-code of an auto sequence is sent, the 3100B automatically sends level offset, sequence number, and generator ID. That data is lost if the "clear memory" code is sent later in the sequence.

The following three op-codes set up the printing format for the print commands 50000-00000 and 51000-00000.

57000-00000	Selects tabulated data only.
58000-nn000	Selects graphed data only. Allows selection of number of data points required in a test for generation of a graph. Range of nn is 04 to 99.
59000-nn000	Selects both graphed and tabulated data. Data points required for generation of a graph same as above.

60000-nnnn0	Selects noise floor in millivolts. Range is 0001 mV to 1000 mV. The noise floor determines the minimum level at which frequency will be measured in ratio or level tests. Also, THD, IMD, PHASE, and CHANNEL SEPARATION (high side) will not be measured if the input is below the noise floor. Reason - large amounts of data could get stored due to wild frequency measurements at noise levels.
61000-nnnn0	Sets dB/step. Range is 0005 (.05dBO to 2000 (20dB). Used to set level change at which data will be stored.
62000-nnn00	Sets points/decade. Range is 004 to 255. Used to set frequency change at which data will be stored.
63000-nn000	Sets noise floor in dB below OdBu (775 mV). This is the same as 60000-nnnn0 above except units are dBu instead of mV. Range is 00 to 60.
64000-00000	Self-check. There is a self-check feature in the 3200A/B which puts up displays if there is a failure. A fail/pass status byte is available to the RS-232 and GPIB ports of the analyzer.
65000-nn000	Specifies impedance for power measurements. Range is 1 ohm to 99 ohms. (i.e. 65000-01000 to 65000-99000)
66000-00000	This code automatically transmits to the analyzer the current auto sequence number, which will then be printed out in the header for each test.
67000-00000	Normal

68000-00000	Fast These two codes put the analyzer into the fast or normal read conditions. Refer to Appendix 3 for the relative speeds. In the fast mode (faster depending on the test), you will be trying to get results faster and be willing to take less accuracy and lose a few data points.

To store a pure op code as a front panel set-up, press the FSK CODE button until the LED is lit. Use the keypad to input the first 5-digits of the desired pure op code followed by pressing the UNITS DISPLAYED button. Then enter the last 5 digits of the pure op code followed by pressing the UNITS DISPLAYED button. Press the PROGRAM SETUP button until the STORE LED is lit.

Enter the desired memory position on the keyboard followed by pressing the UNITS DISPLAYED button. Although there may appear to be other data associated with this front panel set-up (frequency, duration, etc.), the 3200A/B will only recognize the pure op code, transmit it at the fixed-parameter level contained in its associated front panel set-up and ignore the remaining unrelated data.

4-5 BUILDING AN AUTOMATED SEQUENCE - A REVIEW

An auto sequence is a chain of stored panel set-ups. Panel set-ups are primarily defined by the TEST MODE switch fixed parameter, frequency sweep (either log or user-selected frequencies), or level sweep.

Whichever is selected for a given panel set-up, the appropriate parameters are set in with the first two switches in the PARAMETER group.

1. FIXED PARAMETERS: Select frequency, level and the duration that you want that signal to run in the Auto Sequence. A load resistance is selected for the first panel to appear in the auto sequence, which defines load resistance for the entire sequence.

2. FREQ SWEEP - LOG: Select level, start and stop frequencies (START LIMIT and STOP LIMIT of the SWEEP button) points per decade and time multiplier.

3. FREQ SWEEP - SELECTED kHz: Refer to section 2-4 for entering your frequencies. You must also enter a time multiplier.

4. LEVEL SWEEP: Select frequency, start and stop levels in dBm (volts not allowed for level sweep), dB per step, and time multiplier.

The third switch in the PARAMETER group can be ignored here, because BURST or SINE STEP waveforms will not run (will be skipped over) in an auto sequence.

For each panel set-up, the first two switches in the OUTPUT group must be set:

1. CHANNEL: A, B, A and B, or both off (for a noise test).

2. SOURCE OHMS: normally set to 50 ohms, but can also be set to 150 or 600 ohms

DE-EMPHASIS, the third switch in this group, need be set for only the first panel to be called in the sequence. This sets de-emphasis for the entire sequence, same as load resistance above.

REPEAT, the fourth switch, will be ignored in a sequence. If you want more than one identical sweep, you will have to store it in more panels.

The appropriate waveform must be selected:

1. SINE, SQUARE, IM or LF OFF for fixed parameters.
2. SINE for frequency sweeps.
3. SINE, IM, or LF OFF for level sweeps.
4. Finally, key in the desired FSK code. See section 4-1 through 4-4 for this procedure.

Once a panel is configured, go to the PROGRAM group and select PANEL STORE, key in the desired location number (1 through 91) and press the left ENTER button.

Now that all the panels are stored, it would be desirable to get a print-out of what you have in memory. With the printer connected, select PRINT MEMORY in the third switch in the PROGRAM group and press PRINT (upper, right button in the keypad). Referring to this, or your own notes, begin constructing the auto sequence.

1. Push the AUTO SEQUENCE button until SELECT LED is lit. The sequence number will appear on the left side of the left display. If an undesired sequence number appears, key in the desired number between 1 and 16 and press the left ENTER key.

2. Now switch to AUTO SEQUENCE - EDIT, and use the VERNIER keys to get to the starting (or desired) STEP number. At this point, use the EDIT keys. You can key in a panel number and then REPLACE whatever is shown at the current step with that number, or you can INSERT the new number at that step thus pushing the rest of the chain out by one step. Or you can simply delete the current step and close up the chain by one step.

   In this EDIT position of the AUTO SEQUENCE switch, you can press the PRINT button and get a print-out of the current auto sequence with all panels described in the order you have placed them in the sequence.

Let's evaluate the automated sequence detailed in the 3100B generator print-out shown in Figure 6. We arbitrarily stored this auto sequence within auto sequence location six. Auto sequence six consists of panels 20, 21, 24, 22, 23, 30, 25, 28, 26 and 27, in that order. The description of what each panel is doing is shown below. Before building an automated sequence, conceptualize what it is you are trying to do with the automated sequence. The functions and measurements performed in auto sequence six are as follows:

1. Clear Memory. We want to clear the memory prior to making any measurements. Failure to clear memory will result in printing out extraneous data from previous test runs (Panel 20). As a rule, always put this code in the first panel.

2. Reference Level panel. Our reference will be based upon a single channel 1 kHz, 0dBm/600 frequency. Setting reference is necessary as we'll be performing signal-to-noise and frequency response measurements (Panel 21).

3. Measure residual noise. This panel set-up contains terminated outputs enabling us to analyze residual noise. The op code commanded the analyzer into the ratio mode (Panel 22).

4. Insert points-per-decade. This panel set-up is necessary for the analyzer to measure any incoming frequency sweeps. A 4 point-per-decade sweep is used consistently throughout this auto sequence (Panel 23).

5. Measure the frequency response of a sweep. We built a 50 Hz to 15 kHz sweep with which to measure frequency response (as well as other parameters). The 10 digit op code commanded the analyzer into the Ratio mode to measure frequency response in dB (Panel 30).

6. Measure the ThD vs. frequency of a sweep. The same sweep as in Step 6 above except with a different sweep-time-multiplier and we put the analyzer into the ThD vs. Frequency mode (Panel 25).

7. Measure the phase error (in degrees) of a sweep. Same sweep as in Step 6. Op code commands the analyzer into measuring phase error in degrees (Panel 28).

8. Stop. Pure op code commands the analyzer to stop (Panel 26).

9. Print and go to local. Pure op code commands the analyzer to print out all data in its memory and then go to local command (Panel 27).

SECTION 5

FRONT PANEL CONTROLS

5-1 GENERAL

The 3100B Generator has 18 control buttons with 42 LED's possible and 20 keypad buttons. The buttons and LED's are divided into seven functional groups. This Section provides a brief description of each button and LED.

5-2 PROGRAM GROUP

A. PANEL RECALL: Used to recall front panel set-ups from memory.

B. PANEL STORE: Used to store front panel set-ups into memory. Up to 91 front panel set-ups (numbers 1 through 91) can be stored in non-volatile memory.

C. FSK CODE: Used to enter frequency shift keying code (op code) number for remote control of 3200A/B Analyzer. Each front panel set-up must have a non-zero FSK operation code before it may be entered into front panel memory. FSK code may also be used to delete a front panel set-up from memory by inputting an operation code of "00000 00000".

D. AUTO SEQUENCE: Used to recall existing auto sequences or create new auto sequences. Up to 16 auto sequences can be stored in memory (numbers 1 through 16).

E. EDIT: Used to link together front panel set-ups to form auto sequences. Also used in conjunction with keypad for editing of auto sequences. Up to 80 front panel set-ups can be linked in each auto sequence. A front panel set-up can also be used in numerous auto sequences.

F. PRINT MEMORY: Used to print-out contents of front panel memory through standard parallel port. Two different reports are printed, providing a comprehensive numerical listing of auto sequences and front panel set-ups.

G. GEN ID: Used to input a user-selected identification number for the 3100B Generator and security passcodes.

Review Section 3-10 of this manual prior to entering a generator identification number. This identification number will appear in all print-outs and can be utilized when several different 3100B Generators are communicating with one or more companion 3200A/B Analyzers. The assigned Generator identification number will also appear on all print-outs from the 3200A/B Analyzer. The user may choose to use this as a date field or input any other desired numeric code of up to five digits.

5-3 WAVEFORM GROUP

A. SINE: Used in conjunction with the FIXED PARAMETER TEST MODE to output a sinewave of 1 Hz to 102.39 kHz. (1 Hz to 9.9 Hz only operational after initial usage of oscillator). Only waveform used when in FREQUENCY SWEEP TEST MODE. The 3100B Generator can output a sinewave of 10 Hz to 102.39 kHz while in the FREQUENCY SWEEP TEST MODE.

B. SQUARE: Used in conjunction with the FIXED PARAMETER TEST MODE to output a squarewave of 1 Hz to 50 kHz. (1 Hz to 9.9 Hz only operational after initial usage of oscillator).

C. IM: Used in conjunction with the FIXED PARAMETER TEST MODE or LEVEL SWEEP TEST MODE to output SMPTE Intermodulation Distortion test signal. (IM is purchased as an option on the 3100B Generator and may not be contained in your unit. If the option tag on the rear panel of your unit lists option 004, your unit has the ability to generate the IM signal).

D. LF OFF: Used in conjunction with the FIXED PARAMETER TEST MODE or LEVEL SWEEP TEST MODE to output SMPTE Intermodulation Distortion test signal without Low Frequency.

E. BURST: Used in conjunction with FIXED PARAMETER TEST MODE to output 1 Hz to 102.39 kHz toneburst. Frequency defined by usage of FREQUENCY button in PARAMETERS GROUP. Other characteristics (on time, off time, attenuation) defined by usage of functions in PARAMETERS GROUP. Toneburst signals can be stored in front panel setups but cannot be accessed within an auto sequence. (Burst is purchased as an option on the 3100B Generator and may not be contained in your unit. If the option tag on the rear panel of your unit lists option 005, your unit has the ability to generate Burst).

F. SINE/STEP: Used in conjunction with FIXED PARAMETER TEST MODE to output a 1 Hz to 102.39 kHz sinewave followed by a D.C. step signal equal to the peak amplitude of the sinewave. Frequency defined by usage of FREQUENCY button in PARAMETERS GROUP. Other characteristics (sine time on, step time on) defined by

usage of functions in PARAMETERS GROUP. Sine/step signals can be stored in front panel set-ups but cannot be accessed within an auto sequence. (Sine/Step is purchased as an option on the 3100B Generator and may not be contained in your unit. If the option tag on the rear panel of your unit lists option 005, your unit has the ability to generate Sine/Step.

5-4 TEST MODE

A. FIXED PARAMETER: Used in conjunction with FREQUENCY or LEVEL in PARAMETERS GROUP and with selection from WAVEFORM GROUP.

B. FREQ SWEEP - LOG: Used in conjunction with SWEEP button in PARAMETERS GROUP to define sweep characteristics. Automatically selects SINE in WAVEFORM GROUP.

C. FREQ SWEEP - SELECTED kHz: Permits user to define the exact frequencies he wants in a sweep. For details see section 2-4 of this manual.

D. LEVEL SWEEP: Used in conjunction with SWEEP button in PARAMETERS GROUP to define sweep characteristics. SINE and IM in WAVEFORM GROUP can be accessed.

E. AUTO SEQUENCE: Indicates 3100B Generator is in Auto-sequence mode. This LED is activated by usage of AUTO-SEQUENCE button in PROGRAM GROUP. LED is deactivated by selection of other TEST MODE.

5-5 PARAMETERS GROUP

A. FREQUENCY: Used in conjunction with keyboard to define frequency of SINE, SQUARE, IM, BURST, SINE/STEP and LEVEL SWEEP. Also used to define the frequencies for FREQ SWEEP - SELECTED kHz.

B. LEVEL: Used in conjunction with keyboard to define signal level of SINE, SQUARE, IM, BURST, SINE/STEP and FREQUENCY SWEEP.

Maximum range of 24.5 microVolts to 28.6 V, depending upon load, source impedance and output configuration. Units of measure include millivolts, Volts, dBm 150 and dBm 600.

C. DURATION: Used when storing FIXED PARAMETER signals into front panel memory. Signals can be stored with 5 milliseconds to 9999.9 sec durations.

D. LOAD OHMS: Used in conjunction with keyboard to define load impedance of 50 ohms to 99,999 kOhms.

E. SWEEP START LIMIT: Used in conjunction with keypad and FREQ SWEEP LOG or LEVEL SWEEP to define beginning point of sweep. Frequencies of 10 Hz to 102.39 kHz are available, levels of -90 dBm 600 to 30.65 dBm 600 are available. Note that sweeps can sweep upward or downward.

F. SWEEP STOP LIMIT: Used in conjunction with keypad and FREQUENCY SWEEP or LEVEL SWEEP. Frequencies of 10 Hz to 102.39 kHz are available, levels of -90 dBm 600 to 30.65 dBm 600 are available. Note that sweeps can sweep upward or downward.

G. SWEEP PTS/DECADE or SWEEP dB/STEP: Used in conjunction with keypad and FREQ SWEEP LOG or LEVEL SWEEP. Points-per-decade internally calculated to provide linear increments on a log frequency scale. 4 to 255 points per decade available. dB/STEP available from .05dB to 20.00dB in .05dB steps.

H. SWEEP TIME MULTIPLIER: Used in conjunction with keypad, either FREQ SWEEP and LEVEL SWEEP. Sweep can be slowed from most rapid speed (TIME MULTIPLIER = 1) to take 999 times longer (TIME MULTIPLIER = 999). TIME MULTIPLIER can be set at any whole number between 1 and 999.

I. BURST TIME: Used in conjunction with keypad, FIXED PARAMETER TEST MODE and BURST WAVEFORM to define length of time that toneburst will be generated without attenuation. Duration of 5 milliseconds to 9999.9 sec available. Also used in conjunction with keypad, FIXED PARAMETER TEST MODE and SINE/STEP WAVEFORM to define length of time in milliseconds that sinewave will be generated. Duration of 5 milliseconds to 9999.9 sec available.

J. ATTENUATED or STEP TIME: ATTENUATED TIME is used in conjunction with keypad, FIXED PARAMETER TEST MODE and BURST WAVEFORM to define length of time that toneburst will be attenuated. Duration of 5 milliseconds to 9999.9 sec available. STEP TIME is used in conjunction with keypad, FIXED PARAMETER TEST MODE and SINE/STEP WAVEFORM to define duration in milliseconds of D.C. step signal. Duration of 5 milliseconds to 9999.9 sec available.

K. BURST ATTEN: Used in conjunction with keypad, FIXED PARAMETER TEST MODE and BURST WAVEFORM to define amount of attenuation in dB that toneburst will be reduced while attenuated. Available range of 5dB to 60dB in 5dB increments.

5-6 OUTPUTS

A. CHANNEL A, B: Defines whether only Channel A, only Channel B, or both Channels (both LEDs lit) will be output. If neither LED is lit, then both Channels are terminated.

B. SOURCE OHMS 50, 150, 600: Defines source ohms.

C. DE-EMPH 75, 50, 25, 10 microseconds: Used in conjunction with all waveforms and test modes. Defines de-emphasis curve used. If no LED's are lit, then no de-emphasis curve will be used. (De-emphasis is purchased as an option on the 3100B Generator and may not be contained in your unit. If the option tag on the rear panel of your unit lists option 006, your unit has De-emphasis capability).

D. REPEAT: Used in conjunction with FREQUENCY SWEEP and LEVEL SWEEP TEST MODE and AUTO SEQUENCE. Allows user to output continually repeating sweeps or auto sequences until STOP button or REPEAT button is pressed. This function is not available for usage within auto sequences. REPEAT function is not used with FIXED PARAMETERS, as fixed signal is constantly output until STOP button is pressed. **IMPORTANT** Do not allow the 3100B Generator to continuously output level sweeps for a long period of time. It is possible to leave the 3100B Generator in a REPEAT sweep condition and wear out the output attenuator relays. Although the relays have an estimated life in excess of one million operations, it is possible to perform more than 100 sweeps per minute if the 3100B Generator is allowed to remain in a REPEAT sweep condition.

E. START: Used to initiate all test signals. Fixed signals or repeating sweeps will be constantly output until STOP button is pressed.

F. STOP: Used to cease generation of signals.

G. REMOTE: Indicator LED lit when 3100B Generator is being controlled by external controller via G.P.I.B. or RS-232 bus. LED is not user-accessible through button.

5-7 CALIBRATE/RESET

A. CALIBRATE: Used to recalibrate frequency of 3100B Generator compared against internal crystal. The 3100B Generator will automatically recalibrate all frequency ranges and the current fixed frequency upon turning the power switch on. By pressing the CALIBRATE button when the STOP LED is lit the same thing will happen. If the CALIBRATE button is pressed, the AUTO

SEQUENCE LED in the PROGRAM GROUP is lit, and the STOP LED is lit, all fixed parameter frequencies stored in all front panel set-ups and all frequencies stored for the user-selected frequency sweeps will be calibrated. User-selected frequencies only will be calibrated if the FREQ SWEEP - SELECTED kHz LED is lit. If the CALIBRATE button is pressed when a FIXED PARAMETER signal is being generated, the specific frequency being generated will be calibrated.

B. RESET: After power is switched on, the 3100B Generator will always return to the state it was in at the point where power was turned off. It is possible, as with any microprocessor-controlled instrument, that some sequence of control actuations or transient conditions exist that could force the instrument into an undesired or unrecognized mode of operation. The red RESET switch may be used to recover from the catastrophe, but a single push will perform the same resetting operations that are performed at power-on. The current front-panel selection will be restored after the reset operation is complete unless the 3100B memory has failed. The panel will be returned to local control unless the 3100B was given a local lockout command over the GPIB or RS-232 bus. To perform the 'hard' reset you must push the RESET switch twice within a half-second. The RESET switch thus becomes a convenient mechanism for returning to local control from bus control while preserving the current panel.

5-8 KEYPAD

A. TOP ROW OF BUTTONS: Each of the four top buttons serve two functions.

In the TEST MODE, FREQ SWEEP - SELECTED kHz, the left-hand button is used to enter a frequency sequence number (1 thru 10). In this test mode, if the FREQUENCY LED is lit, the three left-hand buttons are used to construct (or edit) the selected sequence. If the 3100B is in AUTO SEQUENCE - SELECT, the left-hand button is used to select an auto sequence number (1 thru 16). With the EDIT LED lit, the three left-hand buttons are used to construct (or edit) the selected sequence. In SELECT or EDIT, the right hand button is used to start printing of the selected sequence. If the MEMORY LED is lit it starts printing of the entire contents of memory.

If the 3100B Generator is not in AUTO SEQUENCE or FREQ SWEEP - SELECTED kHz, the top row of buttons are used following keyboard entries to designate units of measure and automatically enter the data. The left button (UNITS DISPLAYED) is used to enter data in Hertz, Volts, Ohms, Points per Decade, Time Multiplier Units, or

seconds. Unless an alternative button in the top row is desired, the UNITS DISPLAYED button should be used following each keypad entry. The second button from the left allows the user to select units of measure of milliVOLTS and milliSECONDS and also automatically inputs the keypad entry (no enter command is needed). The third button from the left allows the user to select units of measure of kHertz, kOhms or dBm 600, and also automatically inputs the keypad entry (no command is needed). The right button allows the user to select dBm 150 as a unit of measure and also automatically inputs the keypad entry (no enter command is needed).

B. VERNIER/10dB STEPS: When this LED is lit, 10dB STEPS vernier function is operable. User can increase or decrease pre-selected level by 10 dB steps by pressing "up" or "down" VERNIER buttons in keypad. Normal vernier action in .05 dB with LEVEL selected and .01% for FREQUENCY. When the VERNIER/10 dB STEPS LED is lit, the frequency vernier will be 0.1% steps.

C. CLEAR: Clear is used to remove incorrect keyed-in data.

D. +/-" (CHS on early units): Used to change sign of data input via the keypad prior to data being entered into memory. As all keypad entries are assumed to be positive, it is necessary to use +/- to input a negative number, such as -10 dBm 600.

E. Numeric Keys: Used to input various user-selected parameters. If the user input parameter is not within the acceptable range of the 3100B Generator, the 3100B Generator will default to the closest acceptable value and will indicate this value on the display. For example, if 110 kHz is entered, the 3100B Generator will default to 102.39 kHz and indicate this on the display.

Data input is not stored into memory until one of the four enter buttons (top row of keypad) is used.

SECTION 6

G.P.I.B. (GENERAL PURPOSE INTERFACE BUS)

AND RS-232 BUS

6-1 GENERAL INFORMATION

The 3100B Generator may be operated under remote control by a suitable computer which utilizes either the G.P.I.B. or RS-232 bus. The G.P.I.B. is purchased as an option on the 3100B Generator. The RS-232 bus is standard equipment on all 3100B Generators. Except for POWER and RESET, all front panel controls are fully programmable via G.P.I.B. or RS-232.

6-2 G.P.I.B.

A. What is the GPIB?

Some years ago, it was decided that there was a need for a general purpose interface bus that would allow different kinds of devices to communicate with each other. Even though these devices may be quite different from each other in what function they perform, they can still communicate with each other. Some devices may only be able to send data, like a tape reader. This type of device is known as a "Talker". Some devices may only be able to receive data, like a plotter. This type of device is known as a "Listener". Some devices may be able to both talk and listen, like a digital voltmeter. Of course, some device may have to oversee these talkers and listeners while they are communicating. This type of device is called a "Controller".

The bus itself has many names. The three official names are:

1. IEEE 488-1978
2. ANSI MC1.1
3. IEC 625-1

These are all the same, except that the IEC bus uses a different connector. Adaptors for the IEC cable are readily available. Except for the IEC cable, the 3100B will work with any of the above names. Some common bus names used are:

1. IEEE-488
2. GPIB
3. HP-IB

In order for different instrument designers to be able to make their devices work on the bus, certain rules had to be made by the people who wrote the standard for the bus. The main part of these rules is called the interface Functions. These define the rules of bus communications. If the reader desires a complete understanding of the bus, he should consult the document "IEEE Standard Digital Interface for Programmable Instrumentation", available from the IEEE at 345 East 47th Street, New York, NY 10017.

B. What can the 3100B do on the GPIB?

The 3100B can both talk and listen and can also respond to most controller commands. It cannot act as a controller. Before going any further, it is necessary to discuss addresses. In order to know "who's who" on the bus, each device must have its own address. This can be any number between 0 and 30, inclusive. Addresses are used much like they are in the mail. If you want to send a letter to someone, you need to know their address. Address switches are usually found on the rear panel of a device, as on the 3100B. The procedure for setting the 3100B address is found later on in this section.

C. System Set-up

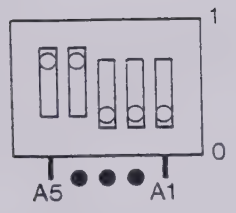
Up to 15 instruments can be connected on the bus, including the controller. However, the total length of all the cables used must be less then or equal to 2 meters times the number of devices connected to the bus, up to a maximum of 20 meters. Caution should be taken if individual cable length exceeds 4 meters. Not all devices must have their power on, but generally at least two-thirds of them should. Either of the two methods shown in Figure 11 can be used to connect up a system. Bus extenders are available for increasing the length of the cables.

6-3 ADDRESSING

The GPIB address switch is located on the rear panel. If the address is to be changed, it should be done so with the power switch off; otherwise, the microprocessor will not read the new address. The address is selectable from 1 to 30 and is factory set at 24. The switch is coded in binary (base two). Therefore, the factory setting of 24 appears as follows:

The address is:

A1	0	X 1	=	0
A2	0	X 2	=	0
A3	0	X 4	=	0
A4	1	X 8	=	8
A5	1	X 16	=	16
		TOTAL:		24



GPIB ADDRESS SWITCH

6-4 REMOTE/LOCAL MODES

In remote, all of the 3100B front panel controls are disabled except the POWER and RESET buttons. During programming, the LEDs and digital displays are valid. In remote, the 3100B may be addressed to talk or listen. The "REMOTE" LED located by START/STOP button will light when the 3100B is in remote.

In local, the 3100B front panel is fully operational and the instrument will respond to the Remote message.

6-5 PROGRAMMING VIA G.P.I.B. OR RS-232

Programming syntax for the 3100B is derived from IEEE Std 782-1982, Recommended Practice for Code and Format Convention. The major difference between this syntax and that of the standard lies in the sequence required to specify measurement units. The standard recommends use of a header field to describe units of measurements as well as function. The syntax for the 3100B uses a header only to define function or type of data and uses a suffix to define units of measurement. The structure of a command thus follows a customary sequence.

Function Numeric Data Units

In addition, this syntax requires a separator between data and the suffix which follows the data.

The general form for a program message (command) is:

Header Separator Data Separator Units Separator

A Header defines a function or the type of data which follows. A data message is the numeric string in "floating point" or exponential representation, i.e., 123.45 or 1.2345e2. For example, to program a start frequency, one might send the following "command" to the generator:

```
SFQ 4.23 kHz crlf   or
SFQ 4.23 KHZ crlf   or
SFQ 4.23E+03 Hz lf
```

An exception to this occurs when you program SFS (FREQ SWEEP - SELECTED) an then FRQ (ready now to build a user - selected frequency sequence). The number is always in kHz. An entry of 50 Hz would be .05 ENT.

The syntax allows interchangeable use of space, the Tab (I or 9) and comma, as separators and does not distinguish between upper and lower case alpha characters.

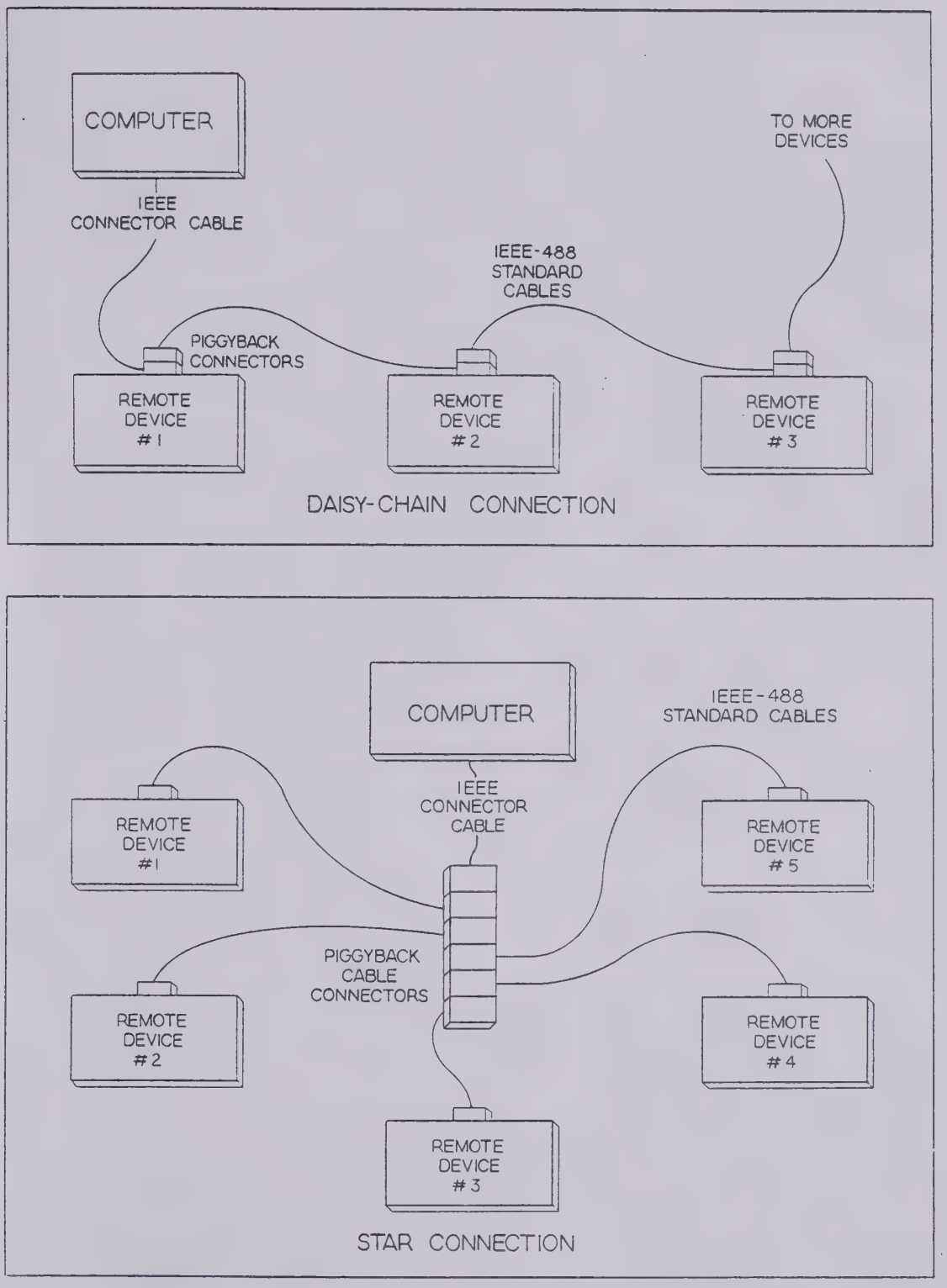


Figure 7. GPIB System Set-up

After a function or data-type command has been sent to the 3100B, it is not necessary to repeat the command until the function or data need to be changed. Command strings are limited to a maximum of 80 characters between cr or crlf terminators, which should not require any special care in programming. In parsing a command input string, the 3100B processes each element of the string as it is encountered, just at it responds to equivalent operator entries into the front panel. When the 3100B cannot interpret a character sequence, it will ignore all characters after the offending sequence until an end of line terminator is encountered. In this event, status messages will identify the error and the offending character sequence.

Please note that the Start command (STR) is special in that any command which follows STR in a single line (until the next line terminator) will be completely ignored.

6-6 PROGRAMMING LANGUAGE FOR THE 3100B AUDIO GENERATOR

TEST MODE:

FRS	Frequency Sweep - LOG
SFS	Frequency Sweep - SELECTED
FXP	Fixed Parameter
LVS	Level Sweep
SEQ	Auto Sequence

SWEEP PARAMETERS: Header must be followed by data.

DBS	dB per Step	also sets Level Sweep
EFQ	End Frequency	also sets Frequency Sweep
ELV	End Level	also sets Level Sweep
PPD	Points per Decade	also sets Frequency Sweep
SFQ	Start Frequency	also sets Frequency Sweep
SLV	Start Level	also sets Level Sweep
FTM	Frequency Sweep Time Multiplier	also sets Frequency Sweep
LTM	Level Sweep Time Multiplier	also sets Level Sweep

FIXED PARAMETERS: Header must be followed by data.

BRA	Burst Attenuation	sets Burst and Fixed Parameters
DUR	Duration	sets Fixed Parameters
FRQ	Frequency	ignored if not in Fixed Parameters or Level Sweep, status 112
LDR	Load Resistance	sets Fixed Parameters if in Auto Sequence Mode
LVL	Level	ignored if not in Fixed Parameters or Frequency Sweep, status 102
TON	Time On	ignored if not in Burst or Sine-Step
TAT	Time Attenuated	ignored if not in Burst or Sine-Step status 115

OUTPUTS:

A&B	A and B channels	sets Fixed Parameters if in Auto Sequence Mode
ABT	A and B channels Terminated	floating, terminated in selected source resistance; sets Fixed Parameters if in Auto Sequence Mode
ACH	A channel	B channel terminated, sets Fixed Parameters if in Auto Sequence Mode
BCH	B channel	A channel terminated, sets Fixed Parameters if in Auto Sequence Mode
CAL	Calibrate	
DE1	De-emphasis 10 microsec	sets Fixed Parameters if in Auto Sequence Mode
DE2	De-emphasis 25 microsec	sets Fixed Parameters if in Auto Sequence Mode
DE5	De-emphasis 50 microsec	sets Fixed Parameters if in Auto Sequence Mode
DE7	De-emphasis 75 microsec	sets Fixed Parameters if in Auto Sequence Mode
DEO	De-emphasis Off	sets Fixed Parameters if in Auto Sequence Mode
NVR	Normal Vernier	0.05 dB steps after setting LVL, 0.01% steps after setting FRQ
RPT	Repeat Sweep/AutoSeq	
SNG	Single Sweep/AutoSeq	
SR5	Source Resistance 50 ohms	sets Fixed Parameters if in Auto Sequence Mode

SR1	Source Resistance 150ohms	sets Fixed Parameters if in Auto Sequence Mode
SR6	Source Resistance 600ohms	sets Fixed Parameters if in Auto Sequence Mode
STP	Stop Output	see note on page 6-11
STR	Start Output	(and start sweep or sequence)
TDB	Vernier Ten dB Steps	10 dB steps after
VDN	Vernier Down	setting LVL, 0.1%
VUP	Vernier Up	steps after setting FRQ (normal increments are .05 dB in LVL and 0.01% in FRQ); VDN and VUP increment sequence steps in AUTO SEQUENCE - EDIT and FREQ SWEEP - SELECTED

WAVEFORM: Header is not followed by data

BRS	Burst	sets Fixed Parameters if in Auto Sequence Mode
IMD	IM Distortion	ignored if not in Fixed Parameters or Level
ILO		low frequency component of IM waveform is turned off.

Sweep (status 103)

SIN	Sine	sets Fixed Parameters if in Auto Sequence Mode
SNS	SineStep	sets Fixed Parameters if in Auto Sequence Mode
SQR	Square	sets Fixed Parameters if in Auto Sequence Mode

PROGRAM: Header must be followed by data plus ENT

RCL	Recall	recall the panel number which follows
STO	Store	store a panel setup into a panel number
FSK		sets Fixed Parameters if in Auto Sequence Mode. Enter FSK code for controlling 3200A/B Analyzer in Auto Sequence Mode. First entry is left-hand display, second is right-hand display.
SEQ	Auto Sequence Number	select an auto sequence number for execution or for storage of chained panel setups

		entering (ENT) panel number automatically advances chain location number Insert a space between each number (i.e. FSK 1 0 5 6 0 ent 1 0 ENT)
CHN		chain panel numbers into an auto sequence.
IDN	Generator ID Number	sets generator identification number; sets into Auto Sequence Mode
NULL		erases all stored panels and auto sequences.
~~SNULL~~ EMPTY		erases stored frequencies for FREQ SWEEP - SELECTED

The above program commands are intended to facilitate loading of panel-operated programs by an external controller. They may be used to program actions of the 3100B and 3200A/B, but if they are so used, the programmer should realize that his documentation of the program may become disconnected from reality.

UNITS:

DBU	dBm 600 ohm	All units entry words must be preceded by valid data. If not, a serial poll will be executed, status 99.
DBC	dBm 150 ohm	
Hz	Hertz	
OHM	Ohm	
KOM	kiloOhm	
MSC	millisec	
SEC	seconds	
MVT	milliVolts	
VLT	Volts	
ENT	Enters displayed units	In Auto Sequence Mode, data (chain no. 0-16) followed by ENT sets the current chain location number to 1. In Chain Mode, ENT increments location number, so that each time a panel number is entered, the location is incremented by 1.

DATA REQUESTS:

ERR?	Error	Returns the string which caused last error

IDN?	GeneratorIDNumber	Returns the ID digit string, not the value
STS?	Status	Returns the status byte for the latest error; RS232 only. A GPIB controller obtains status by executing a serial poll.

SPECIAL:

FHS	Fast Handshake	Handshake of the End of Line message is not deferred for interpretation of the commands
NHS	Normal Handshake (default)	Handshake of the End of Line message is deferred until the 3100 has interpreted the command line.
SRQ	Generate a service request and return status 43 hex (67) each time the 3100B has completed interpretation of a command line.	

The facility provided by this command should be used if the GPIB controller does not send cr plus lf at the end of each command line and if it does not wait for handshake of the END message. It remains in effect until the 3100B returns to local control through a GPIB command to return to local or a RESET or power-on sequence in the 3100B.

Explanation: The 3100B defers interpretation of a command string from the GPIB until it receives an end of line (END) message (SR2 or SR3 of IEEE std. 728). The time required to interpret a command line is variable depending on the number and complexity of the commands in the line. For example, consider the programming sequence:

```
100    fxp sin frq 15.75 kHz lvl 0 dBm STR
110    wait 500 !(milliseconds)
120    frq 19 kHz STR
130    wait 500
```

If the controller does not wait for handshake of the END message, it will start timing the wait duration while the 3100B is interpreting the previous command string and neither wait in lines 110 and 130 will result in signals being generated for 500 milliseconds.

STATUS CODES:

Whenever the 3100B cannot interpret a command, or at the completion of a requested action, a service request will be executed and a status byte will be available to the controller via a serial poll. The meaning of the status bytes is as follows:

Hex	Decimal	
40	64	Completion of Frequency sweep.

41	65	Completion of Level sweep.
42	66	Completion of an auto sequence.
43	67	Interpretation of command is complete. (must be requested by SRQ command).
60	96	Command doesn't match anything in list of commands
61	97	Data was expected, an E for exponential notation was found, but the characters following the E did not denote a valid exponent value.
62	98	Data was expected and an E was found, but non-numeric characters precede the E.
63	99	A units code was received but not preceded by a numeric string. Note that any string containing an E will be analyzed as though it is numeric whenever numeric data is expected, so a string with an E will fail with status bytes 61 or 62, not 63.
70	112	The code FRQ was interpreted, but the 3100B had not been programmed for Fixed Parameters or Level Sweep
71	113	The code LVL was interpreted, but the 3100B had not been programmed for Fixed Parameters or Frequency Sweep.
72	114	The code IMD or ILO was interpretated but the 3100B had not been programmed for Fixed Parameters or Level Sweep.
73	115	The code TON or TAT was interpreted but the 3100B had not been programmed to BURST or SINE/STEP.
74	116	The command string length exceeds 80 characters.
75	117	No device on the GPIB has been addressed to listen to the 3100B.
76	118	The data was syntactically correct but not in the available range for the value being programmed. The 3100B has set the programmed parameter to the closest limit value.
77	119	Panel and sequence programming is prevented by a security code stored in Generator ID.
79	121	IMD Option /004 is not installed.
7A	122	De-emphasis Option /006 is not installed.
7B	123	Special Functions Groups Option /005 is not installed.

When there is no doubt which state the 3100B must be in, a command does not have to be preceded by all the commands which would have to be executed from the front panel in order to arrive at the same state. For example, it is not possible to enter the start level for a Level Sweep from the front panel unless the 3100B is already in the Level Sweep state. The code start level, SLV, received over the GPIB, will set the 3100B into the Level

Sweep state and need not be preceded by the command LVS. For the few cases which are ambiguous, the 3100B will ignore commands which are received while it is not in the proper state and generate a service request to show the error. These cases are:

FRQ, IMD, ILO — May be specified for either Fixed Parameter or Level Sweep Test Modes.

LVL — May be specified for either Fixed Parameter or Frequency Sweep Test Modes.

TON — May be specified for either Burst or SINE/STEP Waveform states.

NOTE ON STOP COMMAND:

The STP command is included for completeness, but is not necessary for normal programming. Receipt of a new command generates an automatic stop before the new command is initiated if the Test Mode is changed by the new command.

Status byte values have been chosen so that:

Values less than 60 hex, 96 decimal indicate normal instrument operation. A service request indicates completion of a requested operation.

Values equal to or greater than 60 hex indicate abnormal operation. There are two sub-groups divided according to whether or not that status code itself indicates the precise error.

Values from 60 hex through 63 hex indicate syntax errors which may be identified by sending the command ERR? and then reading the incorrect string from the 3100B.

Values 70 hex and higher indicate specific programming error which are identified uniquely by the status byte value.

6-7 Configuring the 3000 Series for RS-232 Programming.

The 3000 Series test instruments may be programmed via an RS-232 serial communication port. A standard DB-25S connector is mounted on the rear panel of the instrument. Data and control lines from the connector terminate at an array of posts on an I/O printed circuit board, where they are connected by push-on jumpers to the data and control lines of the port circuitry. Choice of baud rate, character length, parity, number of stop bits, and protocol is selected on a DIP-switch mounted on the I/O board.

To gain access to the I/O board, remove the four or six front panel screws and carefully pull the front panel assembly toward you. The front panel assembly will be self-standing in

front of the instrument. The I/O board is identified by the presence of an 8-position DIP-switch mounted at the front center of the board. If you wish to change only the functions controlled by the DIP-switch, you do not have to remove the I/O board from its socket. Just bend a paper clip to make a simple tool. If you wish to change the connection of the data and control lines, you will have to remove the I/O board completely from its card cage to gain access to the jumpers which connect internal and external lines. To do so, make sure you are grounded to prevent damage to static-sensitive circuits. Disconnect the power and ribbon cables to the front panel, then swing the front panel out of the way and remove the I/O card using the extractor at its bottom corner.

The function of each switch of the 8-position DIP-Switch is as follows:

SWITCH	FUNCTION
1, 2, and 3	Select baud rate, 8 choices from 110 to 9600.
4	Select character length, 7 or 8 bits.
5	Enable or disable parity.
6	Select odd or even parity if enabled by switch 5.
7	Select XON/XOFF or DTR protocol to allow the 3000 to hold off the controller or modem.
8	Select 1 or 2 stop bits.

The unit is preset at the factory with the following selections:

Baud rate 1200.
Character length 8 bits.
Parity disabled.
DTR protocol.
1 stop bit.

Figure 13 shows how to set these switches.

Baud Rate	S_1 1 2 3	Period of Waveform at U8-9
110	0 0 0	570 us
150	1 0 0	417 us
300	0 1 0	208 us
600	1 1 0	104 us
1200	0 0 1	52 us
2400	1 0 1	26 us
4800	0 1 1	13 us
9600	1 1 1	6.5 us

Figure 8. Baud Rate

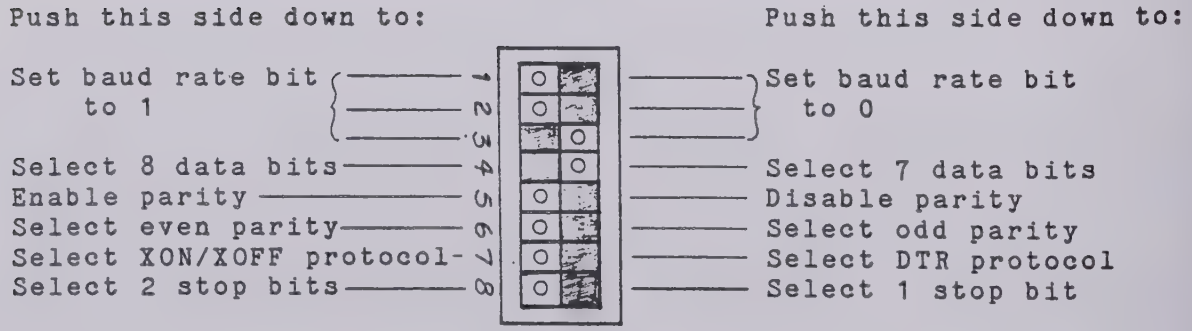


Figure 9. Selector DIP-switch on I/O board

Connection of the data and control lines for use of the 3000 series instruments as either DTE (Data Terminal Equipment) or DCE (Data Control Equipment) is achieved by arrangement of the push-

on jumpers provided. If the unit is to be connected directly to a modem, it should be configured as a DTE unit. Conversely, if it is to be connected directly to a terminal or computer system which emulates a terminal, it should be configured as a DCE unit. A diagram of the connections is shown in Figure 14. The unit is preset at the factory as DTE, ready to connect directly to a modem. Figure 15 shows two possible configurations for placing jumpers. Your system may require a different configuration. The 3100B and 3200A/B require that their DSR lines be continously asserted to enable them to transmit. Their CTS lines should be used for synchronization or "hand shaking" with your controller or modem. The 3100B and 3200A/B assert their RTS lines at power-on and assert them continuously.

Programming via RS-232 uses the set of commands listed for the IEEE 488 bus. The command STS? is provided specifically for RS-232 programming so that the controller may read the error code stored at the time of the latest programming error. Errors are indicated to the controller in two different ways:

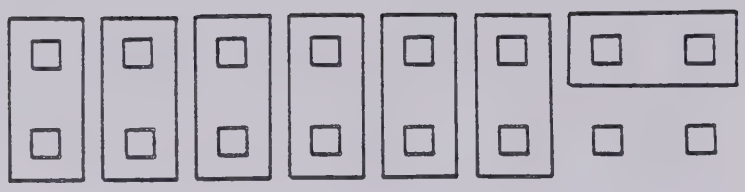
1. Transmission of a NAK character (hex 15, U) for those errors which may be uniquely indentified by a status code, or

2. Transmission of a NAK character, followed by an echo of the character string which cannot be interpreted by the 3100B or 3200A/B, followed by a ? and blank.

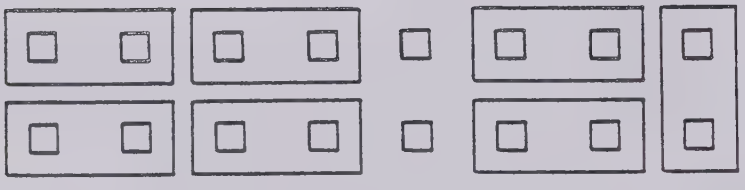
A NAK character alone will be returned for those errors listed for status code of 63 hex or higher in the 3100B and 65 hex or higher in the 3200A/B. For example, if the string "Lvl 100 vlt" is sent to the 3100B, the 3100B will set the level to the highest possible value, return a NAK to show an error in programming, and store the value 76 hex for return by the command STS?. If the string "Lvl 0 dBm" is sent to the 3100B, it will echo the following string:

NAK cr lf "DBM?"

In this case, status code 60 hex will be stored. Note that the quotation marks are used here only to delineate the string in this example, and are not sent by the 3100B or 3200A/B.



Connection as Data Control Equipment (DCE)



Connection as Data Terminal Equipment (DTE)
(As Shipped)

Figure 10. DCE and DTE Jumper Configuration

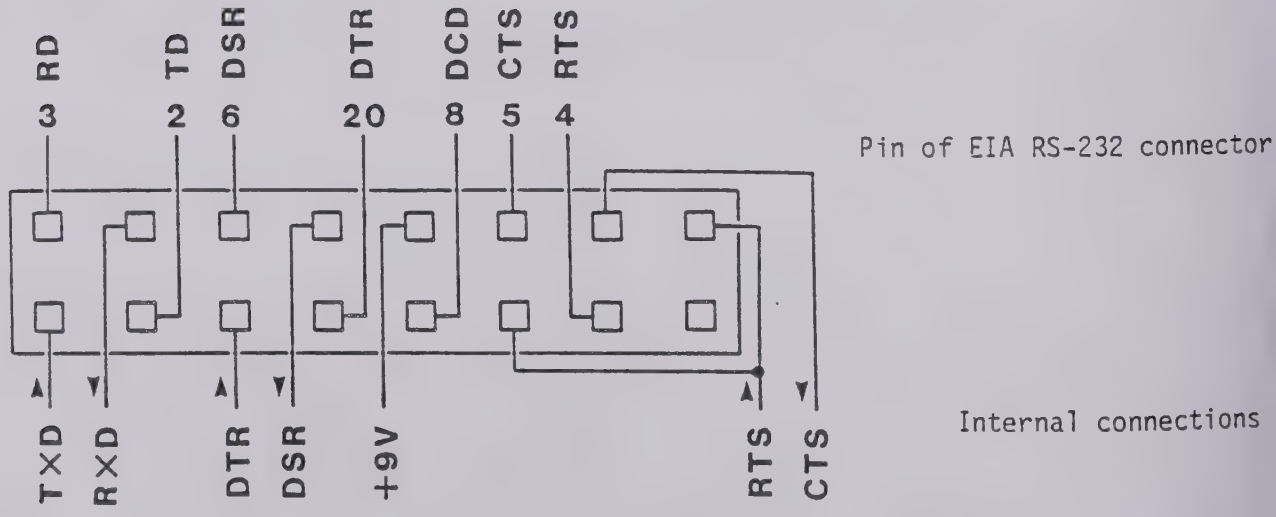


Figure 11. Pin-out of RS-232 Connection

The time required by the 3100B or 3200A/B to interpret each command string sent by the controller is variable and depends on the number of commands in the string and their complexity. Interpretation does not start until an end-of-line character (cr) is received. Use of either XON/XOFF or DTR protocol allows the instruments to hold off the controller until the command string has been interpreted. The pertinent sequence of events is:

Controller sends command string and cr
3100B or 3200A/B asserts DTR or sends XOFF (13 hex, S, also named DC3)
3100B or 3200A/B interprets the command string
3100B or 3200A/B de-asserts DTR or sends XON (11 hex, Q, also named DC1)

If the controller waits until the 3100B or 3200A/B completes interpretation of the command string, the program in the controller may use its own wait statements to, for example, precisely control the time that a signal is output by the 3100B, with no concern for the complexity of the command string preceding a STR command, Note that the 3000 series instruments will always use either DTR or XON/XOFF protocol, depending on the setting of switch 7 on the I/O board. If neither protocol is desired, chose DTR protocol and remove the jumper which connects the DTR line to the RS-232 rear panel connector.

Although the baud rate may be selected for eight discrete values between 110 and 9600, the 3100B and 3200A/B will not be able to process a continuous character stream at 9600 baud. If your controller is capable of sending a command line in a continuous stream at 9600 baud, you will have to limit the data rate by selecting 4800 baud.

The 3100B or 3200A/B will ignore all characters, except the last, that are sent to them while they are interpreting a previous command string.

Completion of events in the 3000 Series instruments which take an unpredictable length of time will be signalled by transmission of an ACK character (6 F) to the controller. These events are:

EVENT	STATUS CODE
In the 3100B	
Completion of a Frequency sweep	40 hex
Completion of a Level sweep	41 hex
Competion of an Auto Sequence	42 hex
In the 3200A/B	
Completion of printout on parallel printer	44 hex
Completion of remote self-check	4F hex

When even or odd parity is selected by switches 5 and 6, the 3000 Series instruments will attach the parity bit to each character they return to the controller, but they do not react to parity errors. They will attempt to interpret the input string as received and indicate an error only if the string cannot be logically interpreted.

Examples:

To Enter an Auto Sequence.

SEQ	20 ent	select sequence 20 and set location counter to 1.
CHN	7 ent in location 1	store panel number 7
	8 ent	store panel number 8 in location 2
	56 ent	store panel number 56 in location 3
	0 ent	terminate the sequence with a 0 in location 4.

To advance to a particular location in an auto sequence, SEQ 20 ent VUP VUP VUP will advance the auto sequence location counter to 4 so that the sequence would start with the panel stored in the fourth location.

SECTION 7

MOST COMMON USAGE PROBLEMS

7-1 GENERAL

The 3100B Generator is an extremely flexible and powerful device with extensive programming capabilities. As with any complex device, there are some common input errors that may occur. To assist you in diagnosing or preventing possible errors, the following list of difficulties and suggested remedies is provided. **IMPORTANT** The 3100B Generator can generate high level output of up to 30 dBm into 600 ohms with both channels driven. Check that your load resistance or device under test will not be damaged before accessing any output level in excess of 10 dBm 600.

SYMPTOM	PROBLEM	POSSIBLE REMEDY
Keyboard unresponsive, all LEDs lit situation,	Transient Power Lock	Turn power off. Allow at least 5 seconds between turning off and on. If this does not correct press RESET button. If keyboard remains unresponsive, contact factory.
Keyboard unresponsive, proper LEDs are lit	Stuck switch	Check that all switches are "free and clear." Check for button struck in depressed conditions.
Keyboard and front panel unresponsive	Printer not connected on line	User has pressed PRINT MEMORY button in keyboard and printer is not connected or is not ready to print. To recover, turn power switch off, wait 10 seconds and turn power back on.
Cannot access function	Unit does not include option	Intermodulation signal, Toneburst, Sine/Step and De-emphasis are optional equipment. Options can be retrofitted in field. Call factory for more information.

SYMPTOM	PROBLEM	POSSIBLE REMEDY
CALIBRATE LED remains lit for several minutes situation, locked,	Software Lock	Turn power off. Allow at least 5 seconds between turning off and on. If this does not correct press RESET button. If CALIBRATE LED remains contact factory.
CALIBRATE LED flashes for a few seconds after each FIXED PARAMETER frequency is keyed in	Frequency calibration software problem	Turn power off. Allow at least 5 seconds between for a turning off and on. If this does not correct situtation, press RESET button. If keyboard remains unresponsive, contact factory.
No signal being output	Output configuration incorrect	Check CHANNELS LED for channel(s) being output versus channel(s) connected to device under test. If CHANNELS LED is not lit, then both channels are terminated. Also check that START green LED is lit.
No signal being output	Both channels being monitored on two channel oscilloscope with phase reversal	Invert connector on one channel to oscilloscope. Phase reversal into grounded device (oscilloscope) shorted outputs. See section 2-1.
Unexpected signals being output	FSK code input	Brief tonebursts will be transmitted if FSK operation codes are being used. If using analyzer other than the 3200A/B Analyzer, FSK operation codes should be suppressed. See Section 3-6.

7-2 FIXED PARAMETER TEST MODE

SYMPTOM	PROBLEM	POSSIBLE REMEDY
Cannot access frequency LED during IMD test	IM uses pre-deter mined	NONE
Sine/step or burst waveform not working properly	Incorrect para-meters selected	Burst Time or Attenuated/Step Time not exceeding at least one period for selected frequency.
Duration function not limiting signal time	Only functional in auto-sequence test mode	Signal duration is only applicable when signal is in front panel memory for later use in auto-Fixed parameter signal is continuously output if user is not running signal from front panel memory during auto-sequence.

7-3 FREQUENCY SWEEP TEST MODE

Cannot access Square-wave, IMD, Burst or Sine/Step	Incorrect wave-form selected	Sine is the only waveform allowed during frequency sweep.
Sweep not outputting 1 Hz to 9.99 Hz	Incorrect para-meter selected	Sweep range during sweep is from 10 Hz to 102.39 kHz.
Cannot access duration LED	function not applicable	Duration only used with Fixed Parameter test mode for front panel memory. Use Sweep Time Multiplier to vary speed of sweep
Sweep not outputting 1 Hz to 9.99 Hz	Incorrect para-meter selected	Sweep range during sweep is from 10 Hz to 102.39 kHz.
Cannot access duration LED	function not applicable	Duration only used with Fixed Parameter test mode for front panel memory. Use Sweep Time Multiplier to vary speed of sweep.
Frequency indicated in right display does not correspond to start or stop frequency limits	-	If not accessing start or stop frequency limits, right display will indicate last Fixed Parameter frequency used by the 3100A Generator. Check START LIMIT and STOP LIMIT SWEEP buttons.

7-4 LEVEL SWEEP TEST MODE

SYMPTOM	PROBLEM	POSSIBLE REMEDY
Cannot access Squarewave, Burst or Some/Step	Incorrect waveform selected	Sine and IM are the only waveforms allowed during level sweep.
Cannot access duration LED	Function not applicable	Duration only used with Fixed Parameter test mode for front panel memory. Use Sweep Time Multiplier to vary speed of sweep.
Cannot select starting and stopping limits using mV or V	Unit of measure incorrect	Start and stop limits only available in dBm 150 and dBm 600.
Level indicated in left display does not correspond to start or stop	-	If not accessing start of stop level limits, left display will indicate last Fixed Parameter level used by the 3100A Generator.

7-5 FRONT PANEL SET-UPS

Front panel set-up cannot be recalled (left display indicated "_ _ _")	No front panel set-up stored in that memory location	Follow procedure in Section 3-2 to store front panel set-up. Also, check FSK code to make sure it contains at least one non-zero digit.
Changes made to front panel set-up are not changing signal	Changes not stored into memory	Follow procedure in Section 3-4. It is necessary to use STORE Function before changes are recorded in memory.
RECALL LED will not light	Front panel memory protected by passcode	Enter passcode (see Section 3-10).

SYMPTOM	PROBLEM	POSSIBLE REMEDY
Cannot access auto-sequence test mode	Incorrect test mode selected	Press AUTO-SEQUENCE button in PROGRAM Group.
Auto-sequence cannot be recalled	Incorrect parameter selected	Auto-sequences cannot be assigned number greater than 16. Auto-sequence LED in PROGRAM Section must be lit.
EDIT buttons not functioning	Improper function selected	EDIT LED in PROGRAM Group must be lit for edit functions to work.
STORE/RECALL LEDS will not light	Front panel memory protected by passcode	Enter passcode (see Section 3-10).
Front panel set-up will not store within auto-sequence	Memory not being accessed	Follow procedure in Section 3-6. Check the REPLACE button is being pressed after keyboard entry of front panel set-up number. Also make sure EDIT LED is lit when accessing REPLACE button.
Unexpected signals being output	FSK code output	Brief toneburst will be transmitted throughout auto-sequence if FSK operation codes are being used. If using analyzer other than 3200A/B Analyzer, FSK operation codes should be suppressed. See Section 3-6.
Front panel set-up within auto-sequence Also a is being ignored. No signal generated	Front panel set-up has unacceptable parameters.	Front panel set-ups using Burst and Sine/Step waveforms will be ignored within an auto-sequence. Also a front panel set-up may contain all zeros in operation code, which means it will be skipped in auto-sequences.

SYMPTOM PROBLEM	PROBLEM	POSSIBEL REMEDY
Auto-sequence does not start, or starts other then where	-	The auto-sequence will start at the step number specified in display and continue until it encounters a step number with an associated front panel set-up number "00". Scroll the auto-sequence to an appropriate beginning step before starting the sequence.
Load impedance is different than expected	Load impedance override feature	The first load impedance setting encountered within an auto-sequence will be used throughout the entire remaining auto-sequence. **NOTE** If the sequence is started other than at location one, the load impedance will be set based upon the load impedance in the first front panel set-up encountered. See Section 3-6.
3200A/B Analyzer is not performing measurements while using 3100B Generator auto-sequence mode	no FSK code being transmitted	If the operating code in the first front panel set-up encountered while running an auto-sequence contains a leading zero, then FSK code transmission will be suppressed throughout the entire remaining auto-sequence. If the auto-sequence is started at other than step one, check to make sure that the front panel set-up contains a valid operation code. See Section 3-6.
Printout shows Analyzer is missing a test	insufficient time duration in panel	Recall the panel that refers to the particular test that the Analyzer is missing. Double the time frame currently stored within the duration category. Restore the panel and re-run the auto-sequence. If the analyzer still misses the test, contact the factory for assistance.
Printout shows multiple readings for one fixed parameter	readings are outside of Analyzer "default" tolerances	If only one reading is desired for each fixed parameter, make sure that there is a leading "3" on the ten digit op code if it is frequency related and a leading "4" if the panel is level related. Therefore, if you have a low number for either pts/decade or dB/step, the, Analyzer will automatically discriminate the incoming signal and then just give you one reading.

SYMPTOM	PROBLEM	POSSIBLE REMEDY
Inconsistant readings associated with in-coming freg. or level sweep	Insufficient sweep time multiplier	The 3200A/B Analyzer manual contains a section (section 3-3) on "rules of thumb" regarding sweep time multipliers as they relate to Analyzer test functions. You may follow the conventions noted and still obtain inconsistancies based on your measuring environment. Recall the panels in question and increase the STM numbers and restore the panel(s). Re-run the auto-sequence and see if the measurements have stabilized. If not, verify the inconsistant reading(s) manually before contacting the factory for assistance - the Analyzer may be accurately reflecting an anomaly in the system under test.
"Pure op code" command not triggering the Analyzer	Insufficient level in op code panel	Recall the panel number containing the "pure op code". Select the Level LED switch position and note the level on the left hand LED display. It should be at least 50 milliVolts. If it is not, increase the level to 1/2 a Volt or so and restore the panel. Re-run the auto-sequence and verify sequence and verify that the analyzer received the pure op code. If not, contact the factory.

SECTION 8

MAINTENANCE

8-1 GENERAL

CAUTION: Do not attempt to repair any fault inside the 3100B Generator. Specialized test equipment and procedures are required to obtain the specified performance. Also, certain components in the 3100B Generator are subject to damage by electrostatic voltages which can occur during handling or probing.

IMPORTANT: The push button switches are permanently lubricated. Application of any lubricant or contact cleaner will shorten their operational life.

8-2 PERIODIC MAINTENANCE

The only user serviceable part is the fuse located on the rear panel.

If the unit is not operating correctly, please contact our Customer Service Department at (408) 378-6540 for assistance in correcting the problem. Specify the 3100B Generator serial number (serial number tag located on rear panel of unit) when telephoning.

APPENDIX 1

3000 SERIES PRINTER PORT SPECIFICATIONS

3000 SERIES PRINTER PORT PINOUT

All standard Centronics printers are supplied with an Amphenol #57-40360, 36-pin interface connector (Centronics #31310019). The pin assignments, name, source and description for each interface signal is listed below.

Parallel Interface Connector	3000 Series Connector	Signal Name	Source	Description
Pin 1,19	Pin 1,19	DATA STROBE	3000	A 1.0 usec pulse (min) used to clock data from the processor to the printer.
Pin 2,20	Pin 2	DATA BIT 1	3000	Data bus
Pin 3,21	Pin 3,20	DATA BIT 2	3000	Data bus
Pin 4,22	Pin 4	DATA BIT 3	3000	Data bus
Pin 5,23	Pin 5,21	DATA BIT 4	3000	Data bus
Pin 6,24	Pin 6	DATA BIT 5	3000	Data bus
Pin 7,25	Pin 7,22	DATA BIT 6	3000	Data bus
Pin 8,26	Pin 8	DATA BIT 7	3000	Data bus
Pin 9,27	Pin 9,23	DATA BIT 8	3000	Data bus
Pin 10,28	Pin 10	$\overline{\text{ACKNOWLEDGE}}$	Printer	Data request pulse sent by the printer.
Pin 11,29	Pin 11,24	BUSY	Printer	Signal which indicates the status of the printer. The signal is high when the printer is busy and cannot receive new data.

Parallel Interface Connector	3000 Series Connector	Signal Name	Source	Description
Pin 12	Pin 12	PAPER EMPTY	Printer	Signal which indicates that the printer is out of paper.
Pin 13	Pin 13	SELECT	Printer	Signal which indicates that the printer is on line.
Pin 14	Pin 14	GROUND	Printer	Ground return.
Pin 15	No Connection			
Pin 16	No Connection			
Pin 17	No Connection			
Pin 18	No Connection			
Pin 31,30	Pin 16,25	$\overline{\text{INPUT PRIME}}$	3000	Printer reset which is only sent when the 3000 is turned off.
Pin 32	Pin 15	$\overline{\text{FAULT}}$	Printer	Signal which indicates an error or fault condition.
Pin 33	No Connection			
Pin 34	No Connection			
Pin 35	No Connection			
Pin 36	Pin 17	$\overline{\text{SELECT IN}}$	3000	Signal which will automatically put the printer on line, this is not supported by all printers.

(note: second pin number indicates a ground return)

APPENDIX 2

3100B G.P.I.B. Programming
Example using the Hewlett Packard 85

```
10 ! File "RN3100"  Example hp85 program for the
20 !  Sound Technology 3100A.              1986-12-19
30 DIM E$[16],N$[2],C$[6]
40 C$="ABCDEF"
50 G9=724
60 SFLAG 1
70 SET TIMEOUT 7;5000
80 ON TIMEOUT 7 GOSUB 9800
90 ON INTR 7 GOSUB 9000
100 ENABLE INTR 7;8
110 WAIT 10
120 CFLAG 1
200 N=0
500 DATA 16.5,12.5,10,8,6.3,5,4,3.15,2.5,2,1.6,1.25,1
510 DATA 800,630,500,400,315,250,200
700 !
710 ! Program output onfiguration.
720 !
730 OUTPUT G9 ;"sin ldr 600 ohm sr5 deo"
740 !
800 ! Program level sweep parameters.
810 !
820 OUTPUT G9 ;"slv 10.0 dBU elv -10 dBU dbs 2 ent"
830 OUTPUT G9 ;"ltm 5 ent sng Bch"
840 !
900 ! Program frecuency sweep parameters.
910 !
920 OUTPUT G9 ;"sfq 41 kHz efq 180 Hz ppd 18 ent ftm 1 ent"
950 !
1000 N=N+1
1010 DISP "Running cycle";N
1020 SFLAG 2
1030 !
1040 ! Set tne flag before you program the 3100.
1050 !
1060 OUTPUT G9 ;"lvs frq 1 kHz Bch STR"
1070 IF FLAG(2) THEN 1070
1080 !
1090 ! Program timing is taken over by the
1100 ! 3100 until it completes the sweep.
1110 !
1120 OUTPUT G9 ;"fxp lvl 100 vlt ABt STR"
1130 !
1140 ! 100 volts is too high.
1150 ! The 3100 should output 26.4 volts and send an SRQ.
1155 !    Status = 76hex.
1160 !
1170 WAIT 2500
1180 SFLAG 2
1190 OUTPUT G9 ;"Ach lvs STR"
1200 IF FLAG(2) THEN 1200
1210 SFLAG 2
1220 OUTPUT G9 ;"frs lvl 0 dBU Bch STR"
1230 IF FLAG(2) THEN 1230
1240 OUTPUT G9 ;"fxp lvl 1 vlt frq 1 kHz ABt STR"
1250 WAIT 500
1260 SFLAG 2
```

```
1270 OUTPUT G9 ;"frs lvl 0 dBU Ach STR"
1280 IF FLAG(2) THEN 1280
1290 OUTPUT G9 ;"fxp frq 2 kHz Ach STR"
1300 WAIT 2500
1310 OUTPUT G9 ;"lvl -10 dBU frq 11.8 kHz A&B"
1320 WAIT 40
1330 OUTPUT G9 ;"5.7 kHz"
1340 WAIT 40
1350 OUTPUT G9 ;"2.8 kHz"
1360 WAIT 40
1370 !
1380 ! Program level and channel for a series
1385 !    of discrete frequencies.
1390 !
1400 OUTPUT G9 ;"lvl 0 dBU Bch frq"
1410 GOSUB 2000
1420 OUTPUT G9 ;"Ach"
1430 !
1440 ! 200 Hz will appear on channel A until the new frequency
1450 !   is programmed. If this is undesireable, program a STP
1460 !   or change frequency before you change channel.
1470 !
1480 GOSUB 2000
1490 GOTO 1000
1500 !
2000 RESTORE
2010 FOR I=1 TO 20
2020 READ F
2030 OUTPUT G9 ;F
2040 IF I<14 THEN OUTPUT G9 ;"kHz" ELSE OUTPUT G9 ;"hZ"
2050 WAIT 1000
2060 NEXT I
2070 RETURN
```

```
8900 ! The following interruot routine is sufficiently
8910 !  complete to detect any programming errors as well
8920 !  as process the sweep-end interruots.
8930 !
9000 S=SPOLL(G9)
9010 STATUS 7,1 ; S0
9020 IF FLAG(1) THEN 9050 ! The program started with SRQ set.
9030 IF S>63 THEN 9070 !          3F hex
9040 DISP "Bad interruot ";
9050 GOSUB 9600
9060 ENABLE INTR 7;8 @ RETURN
9070 GOSUB 9400
9080 CFLAG 2
9090 ENABLE INTR 7;8 @ RETURN
9100 !
9400 IF S<96 THEN RETURN !        60 hex
9410 IF S>111 THEN 9450 !         6F hex
9420 OUTPUT G9 ;"ERR?"
9430 ENTER G9 ; E$
9440 DISP "UNKNOWN STRING IS: ";E$
9450 GOSUB 9600
9460 STOP
9470 !
9490 ! Normally you would not do a return if there is a syntax
9500 !  error. Use STOP as in 9460, correct the error,
9510 !  and re-run the program.
9520 !
9600 W=S DIV 16 !  Convert decimal status to hex for display.
9610 F=S MOD 16
9620 S=W*10+F
9630 IF F>9 THEN GOTO 9660
9640 DISP S
9650 RETURN
9660 N$[1,1]=VAL$(W)
9670 F=F-9
9680 N$[2,2]=C$[F,F]
9690 DISP N$
9700 RETURN
9710 !
9800 DISP "GPIB timeout. Strike CONT to resume."
9810 PAUSE
9820 RESET 7 @ RETURN
9999 END
```

Appendix 3

Sweep Time Multipliers and Time Duration

When the 3100B is in a sweep mode, frequency or level, the sweep proceeds at a pace that is frequency dependant. With a Sweep Time Multiplier of one, the time for each step is as follows:

10 Hz	200 mS
20 Hz	120 mS
40 Hz	80 mS
70 Hz	67 mS
100 Hz	60 mS
200 Hz	45 mS
400 Hz	37 mS
700 Hz	34 mS
1 kHz and above	30 mS

The sweep time multiplier simply mulitplies these numbers the number you key in. For instance, a multiplier of 40 would give you 1.2 seconds for step above 1 kHz (30 mS x 40 = 1.2 sec).

When setting Duration for a "Fixed-Parameter" panel to be used in a chained Auto Sequences, use the time obtained by multipying the "Time Multiplier" obtained from the following chart by the above times. It will be sufficient to use linear interpolation for frequencies in between those given (i.e. for 15 Hz use 120 + 200 divided by 2 or 160 mS).

3100B TIME MULTIPLIER CHART

	TIME	SINGLE CHANNEL FAST/NORM	2 CHANNEL FAST/NORM
1.	RATIO vs. FREQ. @ 0 dBm 100K - 10Hz (10PPD)	20/25	40/45
2.	RATIO vs. FREQ. @ 0 dBm 10Hz - 100K (10PPD)	20/25	40/40
3.	RATIO vs. LEVEL @ 1 KHz +30dB - (-)80dB (10dB/step)	30/65	140/170
4.	RATIO vs. LEVEL @ 1KHz -80dB - (+)30dB (10dB/step)	30/55	100/125
5.	RATIO vs. LEVEL @ 1KHz +30dB - 0dB (2dB/step)	30/35	60/65
6.	RATIO vs. LEVEL @ 2KHz 0 - (+)30dB (2dB/step)	20/20	40/40
7.	THD vs. LEVEL @ 100Hz +30dB - (-)10dB (1dB/step)	30/45	N/A
8.	THD vs LEVEL @ 1KHz +30dB - (-)10dB (1dB/step)	40/50	N/A
9.	THD vs LEVEL @ 5KHz +30dB - (-)10dB (1dB/step)	50/60	N/A
10.	THD vs LEVEL @ 10KHz +30dB - (-)10dB (1dB/step)	45/60	N/A
11.	THD vs LEVEL @ 20KHz +30dB - (-)10dB (1dB/step)	50/55	N/A
12.	THD vs LEVEL @ 100KHz +30dB - (-)10dB (1dB/step)	50/55	N/A
13.	THD vs LEVEL @ 100Hz -10dB - (+)30dB (1dB/step)	35/45	N/A
14.	THD vs LEVEL @ 1KHz -10dB - (+)30dB (1dB/step)	40/50	N/A
15.	THD vs LEVEL @ 5KHz -10dB - (+)30dB (1dB/step)	45/60	N/A
16.	THD vs LEVEL @ 10KHz -10dB - (+)30dB (1dB/step)	50/55	N/A
17.	THD vs LEVEL @ 20KHz -10dB - (+)30dB (1dB/step)	50/55	N/A

18.	THD vs LEVEL @ 100KHz -10dB - (+)30dB (1dB/step)	45/55	N/A
19.	THD vs FREQ @ 0dBm 20K - 10Hz (10 PPD)	30/45	N/A
20.	THD vs FREQ @ 0dBm 10Hz - 20KHz (10 PPD)	30/40	N/A
21.	PHASE vs FREQ @ 0dBm 40K - 10Hz (10 PPD)	N/A	10/25
22.	PHASE vs FREQ @ 0dBm 10Hz - 40KHz (10 PPD)	N/A	10/25
23.	CHANNEL SEP. vs FREQ. 100K - 10Hz (10 PPD)	55/65	N/A
24.	CHANNEL SEP. vs FREQ. 10Hz - 100K (10 PPD)	55/70	N/A
25.	IMD vs LEVEL +30dB - (-)10dB (1dB/step)	40/45	N/A
26.	IMD vs LEVEL -10dB - (+)30dB (1dB/step)	40/50	N/A

Appendix 4

FSK Charts for 3200A/B & 3200B

FSK "rules of thumb":

1. DEFINITIONS.
   A stored "panel" refers to a front panel configuration of the Generator that has been set up for a given test, has a FSK code (op code) entered and a memory location assigned.

2. CHANGING LOAD AND ADDING DE-EMPHASIS.
   In all auto-sequences, the load impedance of the first panel encountered is used throughout the remaining auto-sequence. Also, all panels of a sequence can be de-emphasized by adding the appropriate de-emphasis to the first panel of your auto-sequence.

   To change the load or de-emphasis of an auto-sequence, recall the first panel and change to the new values. Then, re-store the panel in the same panel number. Return to the Auto-sequence LED position and START. The entire auto-sequence will now run at new levels relative to the new load and/or de-emphasis.

3. VARYING THE LEVEL OF YOUR AUTO-SEQUENCE.
   You can easily add an offset level to your auto-sequence in order to match your proof level with the measuring conditions. While the Auto-sequence LED is lit, select the Level LED (within the Parameters subsection). Key-in the needed level offset (a positive or negative level in dB). Then, re-select the Auto-sequence LED. Press the START button. The Level LED will flash a few times reminding you that an offset in level is taking place. The Level LED will then stay on throughout the auto-sequence as a further reminder that an offset is in effect.

   IMPORTANT: When an offset is in effect, the absolute level of the proof will be the level shown in the left hand LED display plus the keyed-in offset level.

4. DELETING UNWANTED PANELS.
   To delete an unwanted stored panel set-up, insert all zero's (00000-00000) into that panel's FSK code section.

5. FSK SUPPRESSION.
   To suppress the FSK bursts in an auto-sequence, recall the first panel of that auto-sequence and enter a leading zero in that panel's FSK code section (for example, 04123-11210). Re-store the panel set-up. The auto-sequence will now run with auto-sequence suppressed. Reverse the procedure to reinstate FSK.

SWEEP TIME multiplier chart

Test vs. Frequency or Level Sweep	Single channel (fast/normal)	Two channel (fast/normal)
1. Ratio/Level vs. Frequency	18 / 40	50 / 90
2. Ratio/Level vs. Level	30 / 35	60 / 70
2a. (Level sweep from a high level to a level below the noise floor)	30 / 65	140 / 170
3. Phase vs. Frequency	---	10 / 25
4. ThD vs. Frequency	28 / 48	---
5. ThD vs. Level	48 / 60	---
6. Channel Separation vs. Frequency	55 / 70	---
7. IMD vs. Level	40 / 50	---

*** TIMING FACTORS ***

SPOT MEASUREMENT Recommended Duration Times

(worst case times shown)

Number of Channels	Test	Time in Seconds Read Status: Fast / Normal
1	Level/Ratio	2 / 2
1	Level & Reference Set	3 / 4
1	Noise	3 / 4
1	Total Harmonic Distortion	3 / 5
1	Intermodulation Distortion	3 / 4
2	Level/Ratio	3 / 4
2	Level & Reference Set	5 / 6
2	Noise	4 / 5
2	Channel Separation	4 / 7
2	Phase	2 / 4

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ANALYZER OP CODES

* * * 'A' DISPLAY * * *

#	1st Character TYPE OF TEST	2nd Character MEASUREMENT	3rd CHANNEL	4th HP FILT	5th LP FILT
0	No Op. Code	Flutter	-*	-*	-*
1	Normal**	Filtered Level	A	22 Hz	15 kHz
2	Noise	Ratio	B	200 Hz	22 kHz
3	F-Sweep**	Notch Lock	A&B	400 Hz	30 kHz
4	L-Sweep**	THD vs. Level		none	80 kHz
5	Pure Op.Codes	THD vs. Freq.			none
6	Pure Op.Codes	Phase/Deg.			
7		Phase/Time			
8		IMD			
9		Channel Sep.			

* * * 'B' DISPLAY * * *

#	6th WEIGHTING FILTER	7th DETECTION	8th LEVEL UNITS	9th THD UNITS	10th MISC	#
0	-*	-*	-*	-*	-*	0
1	A	AVG	Volts	%	Ref Set	1
2	CCIR	RMS	600dBm	dB	Ranging on	2
3	EXT.	Q-PK	150dBm		Ranging off	3
4	none		Watts			4
5			dBrel***			5
6						6
7						7
8						8
9						9

Notes:

-* means no change from last test (therefore code will not be transmitted). The setting will default to the code used in the previous test.

** these test types are used to help determine what data will be stored. F-Sweep will store data based on the number of pts/decade selected using pure op code 62000-xxxxx. L-Sweep will store data when the input level changes relative to the number of dB/step selected using pure op code 61000-xxxxx. Normal will store data when the measured values change more than 5%.

*** used in ThD tests only. Level is stored as dB relative to reference level.

ANALYZER PURE OP CODES:

Number	Description
50000-00000	Print Data
51000-00000	Print Data, then go to Local
52000-00000	Start
53000-00000	Stop
54000-00000	go to Local control
55000-00000	Lock out Reset on front panel
(7) 56000-00000	Clear memory
57000-00000	Tabular data selection
(1) 58000-XX000	Graphic data selection
(1) 59000-XX000	Tabular and Graphic selection

Number	Description
(2) 60000-XXXX0	Noise floor in mVolts
(3) 61000-XXXX0	Set dB/step # into memory
(4) 62000-XXX00	Set pts/decade into memory
(5) 63000-XX000	Noise floor in dB below 0 dBu
64000-00000	Self Check
(6) 65000-XX000	Impedance for Power measurements
67000-00000	Normal read speed
68000-00000	Fast read speed

Pure op code notes:

(1) Range of minimum data points for graph is from 04 to 99 (i.e. 58000-04000 to 58000-99000).

(2) Range of noise floor is from 1 to 1,000 milliVolts (i.e., 60000-00010 to 60000-10000).

(3) Range of dB/step is from .05 to 20.00 dB/step (i.e., 61000-00050 to 61000-20000).

(4) Range of pts/decade is from 4 to 255 pts/decade (i.e., 62000-00400 to 62000-25500).

(5) Range of noise floor is from 0 to -60 dB below 0 dBu (i.e., 63000-00000 to 63000-60000).

(6) Range of Impedance for watts/power measurement from 1 ohm to 99 ohms (i.e., 65000-01000 to 65000-99000)

(7) When this pure op code is used, it must be the first pure op code in a sequence.

Op Code Guide

FSK "rules of thumb":

1. DEFINITIONS.
   A stored "panel" refers to a front panel configuration of the Generator that has been set up for a given test, has a FSK code (op code) entered and a memory location assigned.

2. CHANGING LOAD AND ADDING DE-EMPHASIS.
   In all auto-sequences, the load impedance of the first panel encountered is used throughout the remaining auto-sequence. Also, all panels of a sequence can be de-emphasized by adding the appropriate de-emphasis to the first panel of your auto-sequence.

   To change the load or de-emphasis of an auto-sequence, recall the first panel and change to the new values. Then, re-store the panel in the same panel number. Return to the Auto-sequence LED position and START. The entire auto-sequence will now run at new levels relative to the new load and/or de-emphasis.

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   You can easily add an offset level to your auto-sequence in order to match your proof level with the measuring conditions. While the Auto-sequence LED is lit, select the Level LED (within the Parameters subsection). Key-in the needed level offset (a positive or negative level in dB). Then, re-select the Auto-sequence LED. Press the START button. The Level LED will flash a few times reminding you that an offset in level is taking place. The Level LED will then stay on throughout the auto-sequence as a further reminder that an offset is in effect.

   IMPORTANT: When an offset is in effect, the absolute level of the proof will be the level shown in the left hand LED display plus the keyed-in offset level.

4. DELETING UNWANTED PANELS.
   To delete an unwanted stored panel set-up, insert all zero's (00000-00000) into that panel's FSK code section.

5. FSK SUPPRESSION.
   To suppress the FSK bursts in an auto-sequence, recall the first panel of that auto-sequence and enter a leading zero in that panel's FSK code section (for example, 04123-11210). Re-store the panel set-up. The auto-sequence will now run with auto-sequence suppressed. Reverse the procedure to reinstate FSK.

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2a. (Level sweep from a high level to a level below the noise floor)	30 / 65	140 / 170
3. Phase vs. Frequency	---	10 / 25
4. ThD vs. Frequency	28 / 48	---
5. ThD vs. Level	48 / 60	---
6. Channel Separation vs. Frequency	55 / 70	---
7. IMD vs. Level	40 / 50	---

*** TIMING FACTORS ***

SPOT MEASUREMENT Recommended Duration Times

(worst case times shown)

Number of Channels	Test	Time in Seconds Read Status: Fast / Normal
1	Level/Ratio	2 / 2
1	Level & Reference Set	3 / 4
1	Noise	3 / 4
1	Total Harmonic Distortion	3 / 5
1	Intermodulation Distortion	3 / 4
2	Level/Ratio	3 / 4
2	Level & Reference Set	5 / 6
2	Noise	4 / 5
2	Channel Separation	4 / 7
2	Phase	2 / 4

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Op Code Guide

ANALYZER OP CODES

#	* * * 'A' DISPLAY * * *						* * * 'B' DISPLAY * * *					#
	1st Character TYPE OF TEST	2nd Character MEASUREMENT	3rd CHANNEL	4th HP FILT	5th LP FILT		6th WEIGHTING FILTER	7th DETECTION	8th LEVEL UNITS	9th THD UNITS	10th MISC	
0	No Op. Code	Flutter	-*	-*	-*	0	-*	-*	-*	-*	-*	0
1	Normal**	Filtered Level	A	22 Hz	15 kHz	1	A	AVG	Volts	%	Ref Set	1
2	Noise	Ratio	B	200 Hz	22 kHz	2	CCIR	RMS	600dBm	dB	Ranging on	2
3	F-Sweep**	Notch Lock	A&B	400 Hz	30 kHz	3	EXT.	Q-PK	150dBm		Ranging off	3
4	L-Sweep**	THD vs. Level		none	80 kHz	4	none		Watts			4
5	Pure Op.Codes	THD vs. Freq.			none	5			dBrel***			5
6	Pure Op.Codes	Phase/Deg.				6						6
7		Phase/Time				7						7
8		IMD				8						8
9		Channel Sep.				9						9

Notes:

-* means no change from last test (therefore code will not be transmitted). The setting will default to the code used in the previous test.

** these test types are used to help determine what data will be stored. F-Sweep will store data based on the number of pts/decade selected using pure op code 62000-xxxxx. L-Sweep will store data when the input level changes relative to the number of dB/step selected using pure op code 61000-xxxxx. Normal will store data when the measured values change more than 5%.

*** used in ThD tests only. Level is stored as dB relative to reference level.

ANALYZER PURE OP CODES:

Number	Description
50000-00000	Print Data
51000-00000	Print Data, then go to Local
52000-00000	Start
53000-00000	Stop
54000-00000	go to Local control
55000-00000	Lock out Reset on front panel
(7) 56000-00000	Clear memory
57000-00000	Tabular data selection
(1) 58000-XX000	Graphic data selection
(1) 59000-XX000	Tabular and Graphic selection

Number	Description
(2) 60000-XXXX0	Noise floor in mVolts
(3) 61000-XXXX0	Set dB/step # into memory
(4) 62000-XXX00	Set pts/decade into memory
(5) 63000-XX000	Noise floor in dB below 0 dBu
64000-00000	Self Check
(6) 65000-XX000	Impedance for Power measurements
67000-00000	Normal read speed
68000-00000	Fast read speed

Pure op code notes:

(1) Range of minimum data points for graph is from 04 to 99 (i.e. 58000-04000 to 58000-99000).

(2) Range of noise floor is from 1 to 1,000 milliVolts (i.e., 60000-00010 to 60000-10000).

(3) Range of dB/step is from .05 to 20.00 dB/step (i.e., 61000-00050 to 61000-20000).

(4) Range of pts/decade is from 4 to 255 pts/decade (i.e., 62000-00400 to 62000-25500).

(5) Range of noise floor is from 0 to -60 dB below 0 dBu (i.e., 63000-00000 to 63000-60000).

(6) Range of Impedance for watts/power measurement from 1 ohm to 99 ohms (i.e., 65000-01000 to 65000-99000)

(7) When this pure op code is used, it must be the first pure op code in a sequence.

3100B ID : 10503

ST 3100B AUTO-SEQUENCE No. 14

PANEL No. 56

OP-CODE 56000 00000 -10.00 dBm-600
RL = 600.00 Ohm DE-EMPH : Off

PANEL No. 68

OP-CODE 68000 00000 -10.00 dBm-600
RL = 600.00 Ohm DE-EMPH : Off

PANEL No. 59

OP-CODE 59000 05000 -10.00 dBm-600
RL = 600.00 Ohm DE-EMPH : Off

PANEL No. 21

FIXED PARAMETERS SINE 0.00 dBm-600 1.0000 kHz 6.000 sec Dur

A&B-CH ON RS = 50 Ohm RL = 600.00 Ohm DE-EMPH : Off
OP-CODE 41345 42201

PANEL No. 22

FIXED PARAMETERS SINE 0.00 dBm-600 1.0000 kHz 7.000 sec Dur

A&B-CH TERM RS = 50 Ohm RL = 600.00 Ohm DE-EMPH : Off
OP-CODE 22313 12000

PANEL No. 62

OP-CODE 62000 00500 -10.00 dBm-600
RL = 600.00 Ohm DE-EMPH : Off

PANEL No. 37

LOG FREQUENCY SWEEP SINE 0.00 dBm-600 10.000 kHz TO 50.000 Hz
5 Pts/Dec TIME MULT = 40
A-CH ON RS = 50 Ohm RL = 600.00 Ohm DE-EMPH : Off
OP-CODE 35113 42210

PANEL No. 24

LOG FREQUENCY SWEEP SINE 0.00 dBm-600 15.000 kHz TO 50.000 Hz
5 Pts/Dec TIME MULT = 35
A&B-CH ON RS = 50 Ohm RL = 600.00 Ohm DE-EMPH : Off
OP-CODE 32313 42000

PANEL No. 28

LOG FREQUENCY SWEEP SINE 0.00 dBm-600 15.000 kHz TO 50.000 Hz
5 Pts/Dec TIME MULT = 30
A&B-CH ON RS = 50 Ohm RL = 600.00 Ohm DE-EMPH : Off
OP-CODE 36300 42000

PANEL No. 51

OP-CODE 51000 00000 -10.00 dBm-600
RL = 600.00 Ohm DE-EMPH : Off

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ABBREVIATED OPERATOR'S MANUAL

ST 3000-SERIES B AUTO-SEQUENCE

Your 3100B Generator has been shipped with an example automated sequence loaded into its memory. This auto-sequence is stored in location fourteen. This auto-sequence is designed to perform an automated testing procedure when used in conjunction with the Sound Technology 3200B Analyzer. The following is a brief description on the operation of auto-sequence fourteen:

I. Auto-sequence 14 description. Auto-sequence 14 is a two-channel testing procedure which performs the following tests: Reference set, 'A' channel ThD vs. Frequency, signal-to-noise, two channel frequency response and phase error from 50 Hz to 15 kHz.

II. Set-up procedure.

1. Cable-up both the left and right channels from the 3100B Generator to the inputs of the instrument/system to be tested. Then, cable the outputs of the instrument/system to the 3200B Analyzer's inputs.

2. Manually verify that the A and B channels are not reversed throughout the test set-up.

3. Attach a parallel computer printer to the 3200B Analyzer printer port (the top 'D subminiature' connector on the 3200B rear panel). Insert sufficient paper into the printer and verify that it is "on line".

III. Running the auto-sequence.

1. Select the Auto-sequence LED within the Programming section of the 3100B Generator (upper left-hand corner of buttons).

2. To select auto-sequence 14, press the numbers "1" and "4" and the "units displayed" button on the 3100B's key-pad. You should then see the numbers "14 01 056" in the Generator's LED displays. Those numbers denote that you are in auto-sequence 14, in the starting location (01) and that panel set-up number 56 is the first Generator set-up that will run.

3. Press the green Start button on the 3100B Generator to run this auto-sequence.

A DETAILED ANALYSIS OF AUTO-SEQUENCE 14

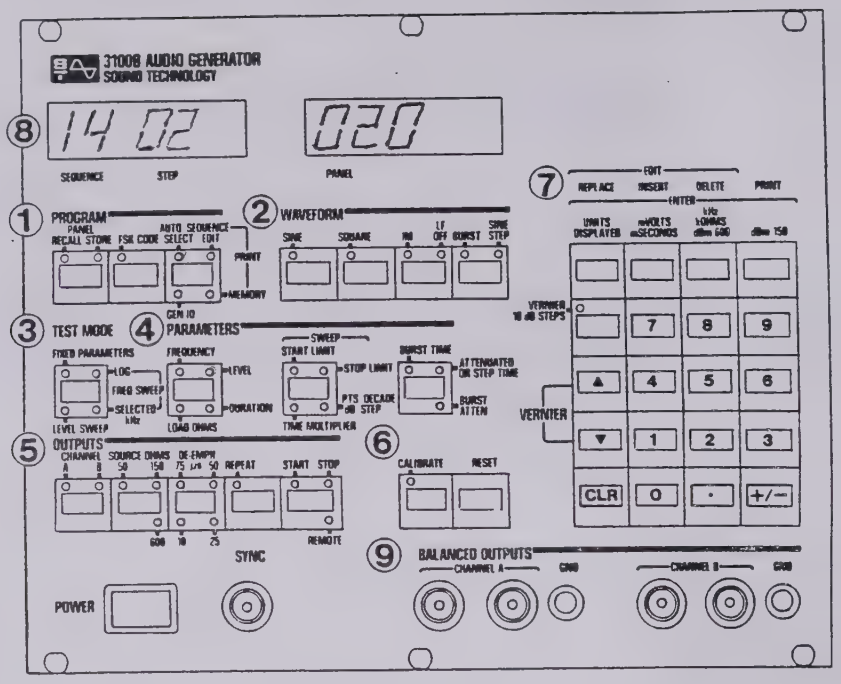
Please reference the two page Generator print-out of auto-sequence and the red op code guide, both attached to this abbreviated manual.

The two page Generator print-out was obtained by accessing auto-seq 14 as though you were going to run the program (see section III on prev page). To obtain the print-out from your unit, connect the printer to Generator and push "Start Print" on the Generator key-pad (upper right- button).

Let us discuss each sub-section of auto-sequence 14:

Location number	panel number	description
1	56	Pure op code number 56000 00000 which denotes "clear memory".
2	68	Pure op code number 68000 10000 which the Analyzer read rate to "fast".
3	59	Pure op code number 59000 05000 which selects "Graphic and Tabular" printout The "05" in the second set of five dig in the FSK code tells the Analyzer to print a Graph if the test category con five or more data points...otherwise t test category will print Tabular only.
4	21	This panel is used to establish syste operating level in order to set refere for future dB-relative measurements. panel outputs a 1 kHz, 0 dBm/600 frequ for 6 seconds. The last digit in the code, "1", instructs the Analyzer to s reference against this operating level
5	22	Signal-to-noise panel. A&B channels a terminated for 5 seconds in order to measure s/n relative to the reference previously set. The 10 digit op code instructs the Analyzer to measure "rat with a 22 Hz HP and 30 kHz LP filter, Weighting and RMS detection.

Location number	panel number	description
6	62	Pure op code 62000 00500 sets "points-per-decade" resolution of incoming frequency sweeps to 5 pts/decade.
7	37	ThD vs. Frequency panel. Generator outputs a 10 kHz to 50 Hz, 0 dBm/600 level, frequency sweep. The 10 digit op code instructs the Analyzer to measure ThD/freq. on the A channel using a 22 Hz LP and 80 kHz HP filter. No weighting, RMS detection, dBm/600 level units and distortion in % are specified.
8	24	Frequency response panel. Generator outputs a 15 kHz to 50 Hz, 0 dBm/600 level, two channel frequency sweep. The associated op code instructs the Analyzer to measure two channel frequency response against the preset reference level.
9	28	Phase error vs. frequency panel. Generator outputs the same frequency sweep as in the previous panel, although this time a bit faster. The 10 digit op code specifies measuring phase error in degrees.
10	53	Pure op code of 53000 00000 commands the Analyzer to stop making measurements.
11	51	Pure op code of 51000 00000 commands the Analyzer to print and then return to local command. If you do not have a printer attached to the Analyzer, you would want to change this op code to 54000 00000 (go to local control) so that you could view the data on the LED displays by scrolling through memory.



3100B FRONT PANEL

IV. Adjusting the level of your Auto-sequence.

Proof number 14 has been designed at a constant 0 dBm/600. However, you may wish to run it at +4 or +8 dBm. Shifting the level of an auto-sequence is easy.

Referring to the front panel drawing above, select the Auto-sequence LED. Then, select proof number 14. Let's assume you want to shift the level of the proof to +4 dBm. Select the Level LED (the button to the right of FIXED PARAMETERS). Key-in "4" and "dBm/600" on the key pad. You'll see "4.00 dB" in the upper left hand LED display.

To run the proof at +4 dBm, push the Green START button. As a reminder that an "offset" is in force the Level LED will flash a few times before the proof actually starts and then stay on throughout the running of the proof. When the main body of the proof starts the level in the upper left hand LED display will revert to the 0.00 dBm stored in the basic proof. Note: the actual output level of the proof is the level shown in the display during the proof PLUS the offset level. When the proof is completed, the offset level will be displayed in the upper left-hand display as a further reminder. The offset level stays in memory until one of two events takes place:

1. you enter a new offset level

2. you push the RED Reset button once (this action removes the offset).

IV. Level Offset, continued.

When an offset has been stored in the generator it will automatically be used with all auto-sequences (not just number 14). Remember, you will always be reminded of an offset with the flashing Level LED at the start of the proof, the continuously lit Level LED throughout the proof and the offset level shown on the upper left display upon completion of the proof.

If the Level LED does not flash at the beginning of the proof or stay on throughout the proof YOU KNOW AN OFFSET IS NOT IN EFFECT.

The concept behind the offset is to give the user the ability to shift a proof level a constant amount. We arbitrarily designed the sample proof with a fixed 0 dBm/600 level. You can easily modify the proof level by changing the level in the frequency response panel (panel 24) from 0 dBm to -10 dBm , for example. Therefore, if a +4 dB offset is in effect that particular panel will run at -6 dBm (-10 dBm minus +4 dB offset = -6 dBm). In conclusion, the offset level will modify the level of a continuously varying proof by a fixed amount equal to the specified offset. An offset level can be expressed in positive or negative dB's.

This abbreviated manual is not intended to replace the more detailed explanations given with the 3000 series operation's manuals. Please refer to these manuals when "building" your automated sequences, or when you have questions on how you might modify auto-sequence 14 which is loaded into your 3100B Generator.

Of course, you can also contact us here at the factory (ask for 3000 series customer assistance) if you have any questions on your new system. We thank you for your purchase!

SOUND TECHNOLOGY, INC

WKM/

Revised 15 November, 1988

MP MASTER
MA26543